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Cover: Skeleton with rickets, ©1987 by Rosamond W. Purcell, from Anatomisch-Embryologisch Laboratorium der Rijksuniversiteit te Leiden, the Netherlands. Purcell, who was a Bunting Fellow 1987-88, is the photographer of three books, including Illuminations, A Bestiary, *(text by Stephen Jay Gould, W.W. Norton, 1986).*

INSIDE H.M.A.B.

We've got both the pictures and the thousand words in this issue. John Stoeckle '47 and Guillermo Sanchez '49 lead off with their tribute to the "age of the eye" in medicine. Their article on the photographic archives of Harvard Medical School is adapted from one they wrote for the Harvard University Library catalog that accompanied an exhibition of photography and its impact on learning.

Then, once and future ways to image. Reginald Greene writes on Francis H. William (Class of 1877), who was one of the first in the world to apply Roentgen's discovery to diagnosing chest disease. Williams could only imagine what David Altobelli '85 and Ron Kikinis then describe: modern and futuristic imaging methods to better navigate craniofacial surgery.

We see a couple ways film and video depict an insider's view of medicine. There's an interview with documentary filmmaker Frederick Wiseman and some of the doctors he portrayed dealing with the dilemmas of patients "Near Death," his latest documentary, filmed at Boston's Beth Israel Hospital. And third-year student Cheryl Dorsey describes what it's been like to be followed by a "NOVA" television crew for their 10-year series, "Can We Make a Better Doctor?"

We have a photographic study of a patient experiencing illness by Mark Rosenberg '72, who tells us how he followed six people as patients to publish his book. And shortest but not least is a moving account by Jim Cashel '90 of Nicaraguan refugee children who have no tears left to cry.

—Ellen Barlow

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ALUMNI COUNCIL: PRESIDENT'S REPORT

Poll's Progress

by Claire Stiles

The fall meeting of the Alumni Council was held in mid-October during Indian summer weather—very nostalgic for an old New Englander. The most important and engrossing topic continued to be the HMS alumni survey that will sample physician disaffection with medicine. The survey will examine such issues as: Is physician disaffection real? What are its causes? And what can be done about it in the future?

Langdon Burwell '44, chairman of the Survey Committee, reported that a representative group of HMS alumni would be sent the questionnaire in early January 1990. Selected interviews will follow of alumni who indicate a willingness to be contacted. The committee is being assisted by survey experts from the Center for Survey Research at the University of Massachusetts.

During the fall council meeting, council members, acting as a preliminary test group, completed the forms and then offered their reactions for the surveyors. The final report from the Survey Committee is expected next spring.

Paul Davis '63, chairman of the council's Alumni Symposium Committee, reported that they will present a proposal at the January council meeting regarding council sponsorship of a symposium on physician disaffection. It is expected that a presentation of the survey results and possibly a workshop on the subject will be included in alumni week this June. The more comprehensive, national symposium will follow in the fall of 1990 at the medical school and will coincide with the centenary celebration of the Harvard Medical Alumni Association.

Reporting from the alumni office, Nora Nercessian, associate director of alumni relations, said that the minority alumni directory would be available by the end of 1989. Its format is the same as the Harvard Medical Alumni Directory, but it also includes the names of all the current minority students to assist them in developing a national network. This information is part of a larger computerized data base available to all alumni, who often call the alumni office to locate old friends or renew friendships.

Planning for the 20th anniversary of affirmative action at HMS has begun. Tributes will include the publication of the history of affirmative action at HMS. Also, a series of talks are now being planned for alumni week 1990, together with the annual gathering of the Coleus Society.

Alumni week arrangements were reviewed by William McDermott '42, director of alumni relations. At recent meetings, reunion committees discussed the option of remaining in Boston for weekend activities rather than planning the usual weekend away. In addition to dinners, a series of optional tours and/or cruises around the Boston, Cape Cod and lower New Hampshire area would be available. There seems to be quite a bit of interest in these new ideas.

Nora Nercessian continues to work on the history of the Harvard Medical Alumni Association, to be published in time for the association's centenary celebration in the fall of 1990. The Harvard Alumni Association (HAA) will be celebrating its 150th anniversary at that same time. Will Cochran '52, our representative to the HAA, suggested we participate in the university's festivities and he will present more concrete plans at our winter meeting.

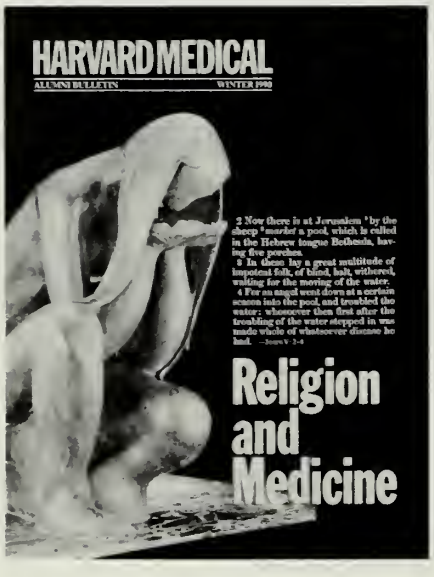
There are many interesting activities scheduled in the coming months. We hope you will follow the progress and join us if you can. □

Claire Stiles '56 is professor of clinical anesthesiology at the University of Southern California School of Medicine and teaches anesthesia at the Rancho Los Amigos Medical Center.

LETTERS

A letter from the editor

To catch an angel is not easy, no matter how many pins you have, but on the cover of the last issue of the *Bulletin* you see, captured in stone, the Angel of Bethesda—at least that is what we think.



The quest began in the Countway Library. What could we use on the cover of the Religion and Medicine issue? Something pertinent but not ecclesiastical, something, shall we say, neutral. Well, angels are neutral, and the Angel of Bethesda deemed appropriate.

Cotton Mather, who was certainly a "religious" figure in 17th century Massachusetts theocracy, was also a physician to the Bay Colony in everything but name. He wrote an important book, *The Angel of Bethesda*, which contains all he knew of the practice of medicine. But alas, no pictures of the angel.

The story told by John (V. 2-4), of the angel who came down at times to trouble the waters of the pool named Bethesda, around which sick folk lay, (the first one in after the angel was cured), could not have escaped artists and illustrators over the years. But who?

William Blake and Gustav Dore were primary suspects but soon ruled out. George Richardson suggested the Massachusetts Bible bookstore on Bromfield Street. This path led to the Congregational Library on Beacon Street and a late afternoon visit to a bookstore in Needham—but alas, no illustrations were found, except those in which the pool is incidental and the angel, a small figure looking rather like a primitive helicopter, is descending. Everyone asked for help was enthusiastic and interested.

A call to the Houghton Library—more enthusiastic, interested help—but nothing quite tangible. Following that a call to Sherwin Nuland, a historically minded surgical colleague in New Haven with access to the Yale Medical Library. Two afternoons generously spent in that magnificent institution produced a lead—the DIAL file in the Fogg Museum (DIAL=Decimal Index of Art of the Low Countries). Helene Roberts, our contact, cheerfully produced a file of possibilities, but all were in museums abroad, except for a painting by Giordano in the Fogg—a busy, Renaissance canvas, mostly animals and a tiny angel figure about to land.

Then came the breakthrough. The National Institutes of Health in Bethesda—they must have an image of the angel somewhere in their clinical center. Storm Whaley, the associate director, was not sure, but would look around. To make a long story short, he did and came up with three alternatives: first, the photograph you saw on our cover; second, a rough-hewn statue, which could be interpreted as the pool of Bethesda; and, finally, a picture, if we wanted it, of a stone from the pool given to the NIH by the Israeli ambassador.

We elected the first alternative. A statue—a fountain actually—entitled "Healing Waters" by Azriel Awret, purchased for, though not commissioned by the NIH for their clinical center. So far as they and we are concerned, this *is* "The Angel of Bethesda."

—J. Gordon Scannell '40

Christian Science and Medicine

Since my husband Richard A. Bloomfield '38 passed on three years ago, I have longed to commemorate his lengthy and fulfilling association with Harvard Medical School. The Winter '90 issue devoted to the subject of religion and medicine has answered my need, although I would have completed the cover citation to include:

John 5.5
And a certain man was there
which had an infirmity thirty and
eight years,
6 when Jesus saw him lie. . . . he saith

unto him, wilt thou be made whole?
8 . . . Rise, take up thy bed and walk
9 and immediately this man was made whole. And took up his bed, and walked.

I nevertheless read each article with interest and appreciation.

When my husband and I married 31 years ago, I was beginning my study of Christian Science. He encouraged me, carefully monitored, questioned, appreciated and took comfort in the demonstrable prophylactic and therapeutic effects evidenced by the application of the understanding of the science of Christianity. He expected our six children to attend Sunday school, and was grateful for healings they had through Christian Science. Intellectual curiosity and humility combined in him so that he never felt threatened by alternate routes to knowledge. He allowed me to be a "whole" person; an incredible gift, under unusual circumstances.

When we were told in December 1986 that Dick had pancreatic cancer, we made the decision to share this challenge in our beloved home. The Newton Hospice of the Good Shepard, in consort with his primary care physician, met Dick's medical requirements. Christian Science, always my physician, met our spiritual requirements. Two months of peace, love and togetherness closed with a memorable hand-holding conversation moments before Dick's tranquil passing.

Our successful joint commitment to religion and medicine has moved me to share this. I would love to think that there might even be a role within the scope of "religion and medicine" for the inclusion of Christian Science. To exclude it seems a sad reflection on John 5:8:9, and the life Dick and I and our children shared.

—Carolyn C. Bloomfield

Peabody Still Circulates

I enjoyed the superb seminar on the interaction of medicine and religion ("An Agreeable Conversation: On the Border of Religion") in the Winter, 1990 issue of the *Bulletin*. Those of us who were privileged to have been a part of the Harvard Medical Unit at the Boston City Hospital are very much aware of the legacy of Dr. Francis Weld Peabody. I believe that copies of his essay, *The Care of the Patient*, were given to all Harvard Medical students in years past, but not recently. We, however, distribute it to all residents and student clinical clerks who rotate through medicine at the Brockton/West Roxbury V.A. Medical Center. I suspect that some do in fact read it.

Peter V. Tishler, MD
formerly Francis Weld
Peabody Fellow, HMS

Seat Shortage at H.U. Commencement

To all returning alumni planning to attend Harvard University commencement morning exercises in June, changes have been made in the arrangements due to the shortage of seats in Tercentenary Theatre. Please note the following: All parents and guests of degree candidates must have tickets to enter Tercentenary Theatre. Tickets are available from the Harvard Alumni Association at Wadsworth House. For additional information, call HAA at (617) 495-5731. □

PULSE

Division of Ethics Launched

In July 1989, Harvard Medical School launched a major effort into the study of medical ethics when it initiated the Harvard Medical School Division of Medical Ethics.

Lynn Peterson, MD, the division's director, said, "We are bringing disparate efforts together to further formalize the humane dimension of medical education." Faculty throughout the school and its affiliates who have been involved in their own study of ethical issues will be tapped, with particular attention paid to the clinical departments of medicine, surgery, obstetrics and gynecology, pediatrics and psychiatry. The division is part of the Department of Social Medicine.

The division is developing an ethics elective and constructing cases for use by the "Patient/Doctor" course and in clerkships. Issues presented by a severely disabled newborn and a terminally ill patient with dementia or in a coma will be discussed along with such other central topics as patient competency, informed consent, confidentiality, and unwanted results following good medical care.

Linda Emmanuel '84, assistant director of the division, has organized a lecture series at MGH dedicated to ethics, which will also be available to other teaching hospitals. Fourth-year students can become involved in research and advanced courses in ethics.

Peterson hopes that in the future a visiting scholars program will be developed, which will include specialists not only in medicine, but in law, philosophy and government.

"We're trying to infiltrate the curriculum and the school," said Peterson, "to try and provide specialists as ethical resources within the school; for example in infectious diseases, people who are interested in the ethical aspects of treating diseases such as AIDS or tuberculosis."

But the division's goals extend beyond the delivery of ethical medical care. The perspective is wider than "clarification of individual values," said Peterson, "and should provide the framework for behaving acceptably in those situations where the patient and family have needs that medicine cannot meet." □

Division of Medical Ethics from left, Linda Emmanuel '84, Troyen Brennan, MD, Lynn Peterson, MD, Lachlan Forrow '83, Edward Hundert '84. Missing are Michael Epstein, MD and James Sabin '64.

PHOTO BY BARBARA STEINER

Funds for Immunology Research

Hoffmann-La Roche has given a five-year, $10 million grant to the Institute for Chemistry in Medicine at Harvard Medical School. Per the agreement, funds will support research in immunology and the ways drugs act on immune system cells, and on the molecular bases of disease. Christopher Walsh, director of the institute and chairman of the Department of Biological Chemistry and Molecular Pharmacology, will oversee this effort.

The immunologic research will combine the efforts of three teams, individually directed by Walsh, Stuart Schreiber of the chemistry department of Harvard University, and Steven Burakoff of the Dana-Farber Cancer Institute and the department of medicine at HMS. Their mission will be to examine the immune system to answer questions about how the cell responds internally to external forces, and how specific genes signal immune cells to produce antibodies or an inflammatory response. The research team will also focus on how to prevent undesirable immune responses, such as tissue rejection in transplants, and will analyze structure and interaction of molecules in the body using x-ray and MRI technologies.

Walsh expressed his enthusiasm about the agreement saying, "The research to be supported by the HMS/Hoffmann-La Roche collaborative agreement provides unusual, if not unique, opportunities to forge scientific links between basic and clinical researchers in the faculty of medicine and in the faculty of the arts and sciences—linkages that otherwise might not occur."

Intramural grants, administered by Walsh, will compose the second element of the Hoffmann-La Roche/HMS partnership. HMS faculty wanting to conduct research in areas of experimental medicine with a molecular science component are eligible to submit proposals.

In accordance with Harvard guidelines for industry/university agreements, patent rights will belong to Harvard and first rights for license will be offered to Hoffmann-La Roche.

The agreement was formally signed November 1989 by Jurgen Drews, MD, chairman of the research board of Hoffmann-La Roche, and Daniel Tosteson '48, dean of HMS. □

Diane Bianchi, MD

Probing Fetal Cells

Prenatal genetic screening may one day be as simple as taking a small sample of blood from the mother. Researchers at Children's Hospital have developed a technique to isolate fetal blood cells that leak from the placenta into the maternal bloodstream, and then to probe those cells for genes that cause hereditary disorders.

"It was like looking for a fetal needle in a maternal haystack," said Diana Bianchi, HMS assistant professor of pediatrics, who worked with the late Samuel Latt '64, professor of pediatrics and genetics, on this effort.

Results are preliminary—only 19 women have been studied—and before they can be verified, thousands more pregnant women need to be tested. But if the test proves successful, it offers distinct advantages over amniocentesis and chorionic villus sampling. It is safer and could potentially be done earlier in a pregnancy. Bianchi reports that fetal cells appear in maternal blood as early as eight weeks.

The researchers isolate the fetal blood cells by using fluorescent conjugated monoclonal antibodies, and separate them from the mother's cells with a fluorescence-activated cell sorter. The DNA within the cells is amplified and exposed to DNA probes to identify fetal sex and to detect any genes that cause such hereditary disorders as muscular dystrophy, cystic fibrosis, sickle-cell anemia and hemophilia.

Bianchi reported these preliminary results in November 1989 at a meeting of the American Society of Human Genetics, and they will be published later this year in *Proceedings of the National Academy of the Sciences.* □

PHOTO COURTESY OF CHILDREN'S HOSPITAL

Brigham Alumni Honored

While celebrating the initiation of the Brigham and Women's Hospital Medical Staff Alumni Association, some of the hospital's finest physicians were awarded.

The BWH President's Medal for distinguished service to the hospital was presented to Lewis Dexter '36, professor of medicine, *emeritus*; Arthur Hertig '30, Shattuck Professor of Pathological Anatomy *Emeritus*; Joseph E. Murray '43B, professor of surgery *emeritus*; J. Sydney Stillman, clinical professor of medicine *emeritus* and Albert Nickerson, Brigham trustee and former Harvard Corporation member.

Dexter was acknowledged for his pioneering work on valvular heart disease and pulmonary vascular hypertension. Hertig, whose contributions led to the development of the contraceptive pill, was also recognized for his research into human reproductive pathology. Murray was cited for his pioneering work in transplantation and plastic surgery, and Stillman was acknowledged for his development of diagnostic and treatment techniques for children and adolescents.

In honor of the 75th anniversary of the founding of the Peter Bent Brigham Hospital, three medical staff alumni received Robert Cutler Medals: Gustave Dammin, Elsie T. Friedman Professor of Pathology *Emeritus*, and former PBBH chief of pathology; Leroy Vandam, professor of anesthesia, *emeritus* and former PBBH director of anesthesia; and Carl Walter '32, clinical professor of surgery *emeritus*, inventor of the plastic blood bag and former head of the PBBH blood bank. □

CAMPAIGN REPORT

Campaign Capsules

■ Alumni gathered recently in Chapel Hill, North Carolina and Minneapolis, Minnesota to mark the start of alumni campaigns in those regions. Hosts at the Chapel Hill event were William P. Peete '47, William R. Pitts '33, and the 20 other members of the North Carolina Alumni Committee. Guests traveled the roads of the Tarheel State to attend the reception, dine with fellow alumni, and hear Dean Daniel C. Tosteson '48 report on the campaign and on new developments at 25 Shattuck Street. In his introduction of the dean, Peete noted that "a visit by Dr. Tosteson to the Chapel Hill area is akin to a homecoming, since many of us had the pleasure of working with Dan in the days when he served Duke as a distinguished professor and department head."

■ When Minneapolis alumni launched their regional campaign under the able leadership of Cecil H. Chally '65, one member of his committee, Douglas Yock '73, could vividly recall what financial assistance had meant to him during his student days at Harvard. Wouldn't it be appropriate, he suggested, to establish a scholarship fund for Harvard Medical students who are residents of Minnesota and its surrounding states? Members of the Minneapolis Committee braved frigid winter temperatures to visit local alumni on behalf of the school, and have already raised enough in pledges to establish the Harvard Medical School Alumni/Minneapolis Financial Aid Fund. Contributions toward the renovation of Vanderbilt Hall as well as unrestricted support are also pouring forth from the Minnesotans.

■ Florida and Georgia conduct regional campaigns this spring. In Florida, where two campaigns—east coast and west coast—are being conducted concurrently, alumni on the west coast gathered for a dinner reception on February 27 in Tampa; on the following evening alumni from Miami to West Palm Beach celebrated in Coral Gables. In Georgia, alumni from throughout the Peachtree State as well as from parts of Tennessee and South Carolina gathered on March 2 in Atlanta to celebrate the start of the alumni campaign. Dean Tosteson was present at each of the three kickoffs and reported another banner year for the alumni fund.

■ Two members of the class of '43A, Edward P. Richardson Jr. and George R. Livermore Jr., each concerned about recent rises in the cost of a medical education, have individually established scholarship funds to help lessen the financial burden on Harvard Medical students. Richardson and his wife, Margaret, have established a fund with a generous contribution that will provide aid to several students beginning next academic year. The fund's beneficiaries will be known as Richardson Scholars.

Richardson has long shown an interest in the education and welfare of Harvard Medical School students. As the Bullard Professor of Neuropathology, *Emeritus*, he continues to devote himself to teaching and research at Harvard and at the Massachusetts General Hospital.

Livermore enjoyed a full career as a surgeon in Memphis and continues to practice in the surgical outpatient department of the Regional Medical Center. As an associate professor of surgery at the University of Tennessee, he has seen more and more young doctors entering their residencies with medical school debts that, on a national scale, can reach upwards of $100,000. Concerned about that trend, he and his wife, Nancy, have established the Dr. and Mrs. George K. Livermore Jr. Scholarship at Harvard Medical School. Their generous gift, in the form of an annuity trust, will provide financial assistance to students, who will be known as Livermore Scholars.

Edward P. Richardson Jr. '43A

■ A posthumous honor: Alfred O. Ludwig '30, who died at the age of 80 in December 1986 after serving Harvard Medical School and the Massachusetts General Hospital throughout his professional career, was honored posthumously by family, patients and friends, who contributed toward the naming of a classroom in his memory. The Dr. Alfred O. Ludwig Memorial Room, a tutorial room located on the second floor of the Medical Education Center, displays a framed, photographic portrait of Ludwig. Beneath the picture is a plaque inscribed with some of the distinctions that earned "Dutch" Ludwig an honored place in the field of psychiatry.

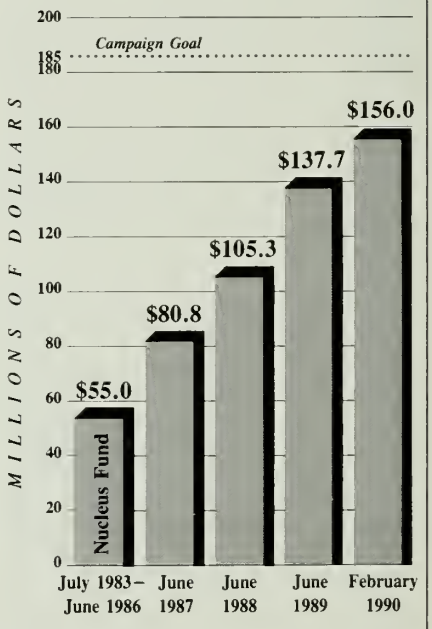
Upon seeing the room for the first time, his wife, Julie Armstrong Ludwig, said that her husband had special memories of his student days at Harvard, where he was permanent class president, and of his four years in Vanderbilt Hall. That the Dr. Alfred O. Ludwig Memorial Room looks across Longwood to Vanderbilt Hall, she said, "would mean a lot to Dutch."

■ A former patient of Addison G. Brenizer '40 made a generous contribution to the school in gratitude for his doctor's "45 years of caring." News of the gift soon led to additional contributions from other grateful patients, which have in turn led to the Addison G. Brenzier Scholarship Fund at Harvard Medical School. The fund, well on its way toward its goal, honors a man who, prior to his retirement, was known as the leading thoracic surgeon in Charlotte, North Carolina.

■ Vanderbilt Hall update: The architect overseeing the renovation of Vanderbilt Hall, which was completely closed to students this academic year for the first time since its doors opened in 1926, reports that work is on schedule for the hall to reopen this fall. This news is of special interest to the growing group of Vanderbilt Hall Associates—alumni who contribute campaign gifts of $10,000 or more toward the renovation of the hall. Associates will be acknowledged on a donor's plaque, located in the building's main foyer. Alumni who contribute $20,000 will be offered the opportunity to have their old rooms named in their honor.

By the way, there's no truth to the rumor that the tennis court was eliminated in the new plans, so bring your racquets next time you visit! □

Campaign for the Third Century of Harvard Medicine



The Campaign reached $156.0 million in gifts and commitments as of February 28, 1990. The Campaign goal is $185 million.

BOOK MARKS

Heart and Soul

by Paul Russell

TRANSPLANT: A HEART SURGEON'S ACCOUNT OF THE LIFE-AND-DEATH DRAMAS OF THE NEW MEDICINE by William H. Frist, Atlantic Monthly Press, New York, 1989.

Transplant by William Frist '78 tells the personal story of a young heart surgeon who, after a residency at Stanford, returned to his home in Nashville to lead a heart transplantation program at Vanderbilt. As he begins the book, the author is torn away by a telephone call from an all too rare opportunity to read a bedtime story to his child. The call, signaling the availability of a heart donor for one of his patients, starts a minute-to-minute account of the all-night effort: the planning, the Lear jets and helicopters, the multitude of telephone calls, the uncertainty, and the persistent attention to a series of critical details which must be traversed in sequence, like the beads on a rosary, before an organ finds a new home in a needy patient.

Frist, with the assistance of professional writer Charles Phillips, has put together a series of anecdotes of his experiences as a cardiac transplant surgeon, told in a fast paced, polished style. Through flashbacks Frist talks of his early life, his strong and admiring relationship with his accomplished father, the founder of the Hospital Corporation of America, and his support from an able and caring family. Favored from the beginning, Frist describes himself as accustomed to success—an expectation that was reinforced by satisfying years as a Princeton undergraduate. Harvard Medical School and surgical residency at the Massachusetts General were more difficult years.

At medical school he underwent a "hardening" process, which involved "questioning every notion about myself that ever kept me going." Then, "The subtle and insidious wearing down that had started with medical school continued through residency." He felt alienated and angry when a senior resident "carefully humiliated me in front of my peers" after he had failed to pick up an important clinical sign in one of his patients.

These difficult years also included a breakup with a long-standing girlfriend just prior to their planned marriage. It was a time when Frist felt isolated from his previous life and driven by the merciless schedule of the surgical resident, which kept him away from more relaxing activities such as flying his own airplane freely across the country.

Cardiac surgical training at the MGH was no better for him and he was again "stretched to the limit." His new love, Karyn, whom he promptly married and with whom he enjoyed a surgical rotation in England, was a most helpful influence and became a mainstay.

Moving on to further cardiac training at Stanford, Frist found life much more to his liking. The "easygoing" approach of Norman Shumway and his colleagues suited him personally, and he thrived as a junior member of the closely knit Stanford heart surgery group where he became a young knight errant in the special world of heart transplant surgery. He still felt he had to rely on "the Great Wall," an emotional barrier he had built around himself, but to a lesser degree.

Back home in Nashville his experi-

Organ Drive

William H. Frist '78, director of the Heart and Heart-Lung Transplantation Program at Vanderbilt University Medical Center, said he wrote *Transplant* to raise awareness about our nation's critical shortage of organs available for transplantation.

Frist's bookjacket includes an official Organ Donor Card to encourage people to think about organ donation. Though he admits that a card is found in fewer than 2 percent of the cases where a person becomes an organ donor—and even then, the hospital will still ask the family before intervening—Frist hopes the card and the book will initiate dialogues among families about organ donation.

According to Frist, the organ shortage is summarized in simple economics: "On the supply side of the equation we have roughly 25,000 people who are brain dead who could be organ donors. Of that figure, we know only 3,800 actually become donors for all organs. On the demand side, we have an estimated 10,000 a year who could benefit from heart transplantation."

Varied and complex factors contribute to this shortage. Along with low public awareness about donation is the problem of hospital teams neglecting to ask families of brain death victims to donate the patient's organs. "I know it's not an easy thing to do," Frist said, "having been in that position myself, many times."

Several opinion polls, however, suggest that people don't resent being asked about donation—whether or not they grant permission. Frist cites a recent Gallup poll that estimated that 80 percent of families would donate if they were asked.

"If we're in the business of helping people and helping society at large, we're not fulfilling our moral obligation if we do not make that opportunity known to people," he said. □

—Terri L. Rutter

ences with individual patients are nicely told. One gets a lifelike impression of the interaction of nurses, doctors, and others in the complex management of heart and heart-lung transplants.

Although Frist is occasionally accused of "chasing headlines," he makes a case for good public relations in a successful transplant program, especially a new one. He becomes involved with national television appearances and other public relations efforts to promote organ donation.

Both triumphant and tragic clinical outcomes are presented in vivid detail. The descriptions of clinical events tend to be highly subjective: "My adrenalin began pumping as I got ready to open the pericardial sac that holds the heart. This is it, I thought." Written more for the lay reader, descriptions are often in words that would not be selected by most surgeons. For example, an operating room is described as "supermarket bright and totally without character—pictureless beige walls, stainless steel tables draped in blue green, an assortment of odd-looking instruments carefully laid out like alien tableware."

The lay reader is also in for a considerable amount of useful and interesting information, which is scattered through the book; information about cholesterol, blood pressure, the number of times one's heart beats a day, as well as the basics of transplantation management.

In summary the book is entertaining, lively and interesting. Given the experiences of its appealing young author, it is not surprising that the view presented of the transplant field is focused heavily upon the cardiac transplant subculture and inevitably upon the denizens of the Stanford group, led by the colorful Norman Shumway. Thus, this reviewer might be forgiven for having a slightly different perspective regarding the development of transplantation and some of its major advances without dismissing the significant contributions from Stanford.

Overall the book tells a warm and human story about an attractive young surgeon and his progress through difficult years of development to a happy ending in an environment in which his talents and many opportunities are finding the application that they deserve. □

Paul Russell, MD is John Homans Professor of Surgery at Harvard Medical School. He has also served as chief of the Transplantation Unit at the Massachusetts General Hospital.

COMMENTARY

Medicine Under Seige

by W. Reid Pitts

Because medicine is under attack from many fronts, all doctors feel some degree of paranoia.

Doctors who entered medicine for financial rewards have found that the conditions that lead them to invest their education, training, choice of specialty, capital and debt are constantly changing in unpredictable ways that they cannot control. Frozen fees, regulation of laboratories, diagnostic centers and surgical out-patient facilities, pre-certification for elective surgery, the liability crisis and real estate costs add to the pressures of the CONs, DRGs, HMOs, and ETs.

Doctors who went into medicine for social prestige find they are attacked and blamed for the inadequacies of a system not of their making and beyond their control. This constant criticism comes from all sides—the government, the press, the health and liability insurance industry, the statisticians, the economists, the lawyers, the business community, academic medicine, the administrators, and the hospital boards.

Doctors who entered medicine for a career in research to "cure cancer," to "cure heart disease," to "cure infections," etc., find that funding is severely curtailed. Many researchers leave universities to work in pharmaceutical laboratories in directed research. Medical schools have joined with industry to fund research to license and patent discoveries, and to fund applied research rather than basic science. These partnerships cut down the vital exchange of information among scientists in order to protect the possible patent rights and direct research into "profit areas."

Even medical schools that forbade drug salespeople from giving medical students doctor's bags, stethoscopes and medical textbooks for fear of influencing their future decisions, have joined in these partnerships thereby showing the truth in the adage, "Every man has his price" and "He who pays the piper, calls the tune." Just like Esau, academic medicine has sold its birthright—academic freedom for a bowl of porridge, industry funded research, licenses and patents.

Doctors who went into medicine to render the best possible care to all patients, find they are being regulated into withholding and downgrading their care by the "cost containment" provisions of certificates of need (CON), diagnostic related groups (DRGs), pre-paid health plans (HMO, PPO, etc.), pre-certification for elective surgery, set fixed fee schedules with the end of balanced billing, limitation of post-graduate training to five years, anti-trust suits by the FTC, and the proposals of expenditure targets (ETs).

Academic medicine has sold its birthright—academic freedom for a bowl of porridge.

Thus all doctors and hospitals, no matter what their motivation, feel threatened. The attack comes from all sides and we have no way to control the situation. Even the most dedicated and optimistic among us doctors are slowly, "letting the bastards wear us down." The result is the paranoid siege mentality society sees throughout the health care system. Such a situation is unhealthy to physicians and patients alike. □

W. Reid Pitts '67 is associate professor of clinical urology at New York Hospital and Cornell Medical School. He is also in private practice in urology.

THE BODY IN FOCUS

The Photographic Archives of Harvard Medical School

by John D. Stoeckle and Guillermo Sanchez

To the age of the hearer,
in which men had
heard, and heard only,
had succeeded the age
of the eye . . .

William Osler
Harveian Oration 1906

With the invention of the daguerreotype (1839) and the talbotype (1840), medical practitioners quickly explored uses for photography. They first took family portraits and scenic views. Then, perceiving the camera's potential to document medical findings, they focused on the hospitalized sick and scenes of care and treatment.

As amateur scientists, they took photographs of the objects they researched, often archaeological and botanical specimens. A notable early example in the Harvard Medical School archives is an 1854 daguerreotype of a fossil impression on a rock. John Collins Warren, then *emeritus* professor of surgery, used this image to illustrate a text that is said to be the first scientific book to contain a photographic illustration. Since these simple beginnings, the camera's shutter has snapped often as the clinical gaze searched widely in and about the art and science of healing.

Today the contents of medical photographic archives are as extensive and diverse as they are intense and specialized. An inventory of archival, departmental, and personal collections reveals photographs of treatment institutions (the hospital, its wards and private rooms, clinics, offices and waiting rooms); professionals (doctors, nurses, social workers and technicians); medical work (operations, physical examinations, caring acts of nurses and doctors); machines of diagnosis and treatment (electrocardiograms, x-ray equipment, scanners); diagnostic laboratories (mi-

REMARKS

ON SOME

FOSSIL IMPRESSIONS

IN

THE SANDSTONE ROCKS OF CONNECTICUT RIVER.

BY

JOHN C. WARREN, M.D.

PRESIDENT OF THE BOSTON SOCIETY OF NATURAL HISTORY.

BOSTON:
TICKNOR AND FIELDS,
135, Washington Street
1854

"Fossil Footprint in Stone," by George M. Silsbee. Used by John Collins Warren as a frontispiece to Remarks on Some Fossil Impressions, *1854. Countway Library.*

croscopes and counters); and, the focus of the greatest number of photographs, the patients and their bodies.

The extensive production of body and patient images—along with those of institutions, professionals, medical work, technologies, and laboratories—has found many uses. These photographs present visible, scientific proof about disease for clinical diagnosis and instruction. They document hospital records, educate patients and the public about disease and treatment, preserve institutional memories and even offer a medical art form. They serve as a rich source of illustration for teaching collections, hospital records, professional journals, textbooks, newspapers and magazines, and modern advertising literature.

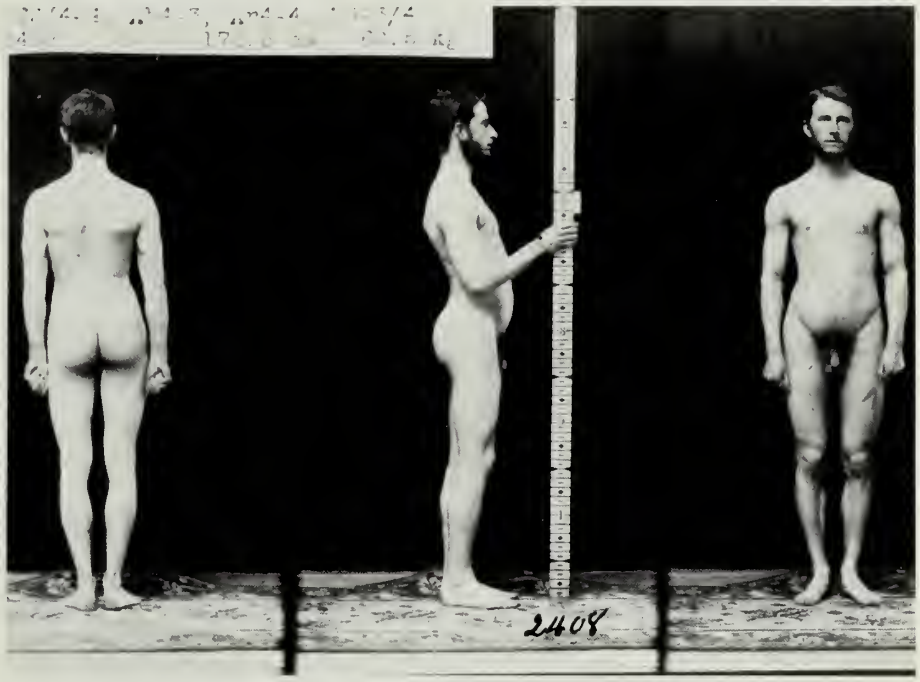
Not only of value to the medical community, the hospital-medical school archives offer a wealth of visual information for historians chronicling changes in medical instruction, practice and care. The ways these images have been used illustrate how the medical community has defined its mission and identity in search of public support.

From its Hippocratic beginnings, medicine has been viewed as both science and art. Understanding the human body in health, disease, and treatment is medicine's science; its art is in understanding the patient, the illness, and the doctor-patient relationship. Art tailors treatment to the individual—to the patient as a person; science promises accurate diagnosis. Clinicians have focused their cameras on the body, since ancient times the objects of medicine's science and art, the practitioner's cure and care, the researcher's observation and experiment.

Early on, diagnosis dealt only with the patient's bodily complaints. These subjective feelings were grouped as symptoms, then categorized into diseases. In the 17th century, visual inspection by the pathologist's naked eye of the organs of the dead inner body and microscopic scrutiny of those tissues showed objective signs of disease. Later, doctors physically examined the living outer body by inspection, auscultation, and palpation, which revealed objective physical signs that correlated with pathologic signs. From symptoms and physical signs the doctor could then recognize the abnormal structure and function of the inner body and make a clinical-pathologic correlation—a diagnosis of disease. Photographs of the sick patient's body confirmed what the doctor described and reported from his inspection, providing a pictorial documentation of the diagnosis for others unfamiliar with the case.

To document their observations, diagnoses, and theories of health and disease, clinicians snapped the camera's shutter on bodies of all conceivable varieties: the healthy (their posture and somatotype), deformed (the achondroplastic dwarf), disabled (the spastic paraplegic), growing (the baby and child), developing (under or over nourished), wounded (the extent and site), treated (before and after), distressed (shame and grief), mentally ill (asylum inmates), diseased (scrofula and leprosy), and even the dead bodies (the corpse and its organs). In photographic collections at Harvard there are numerous examples of such images.

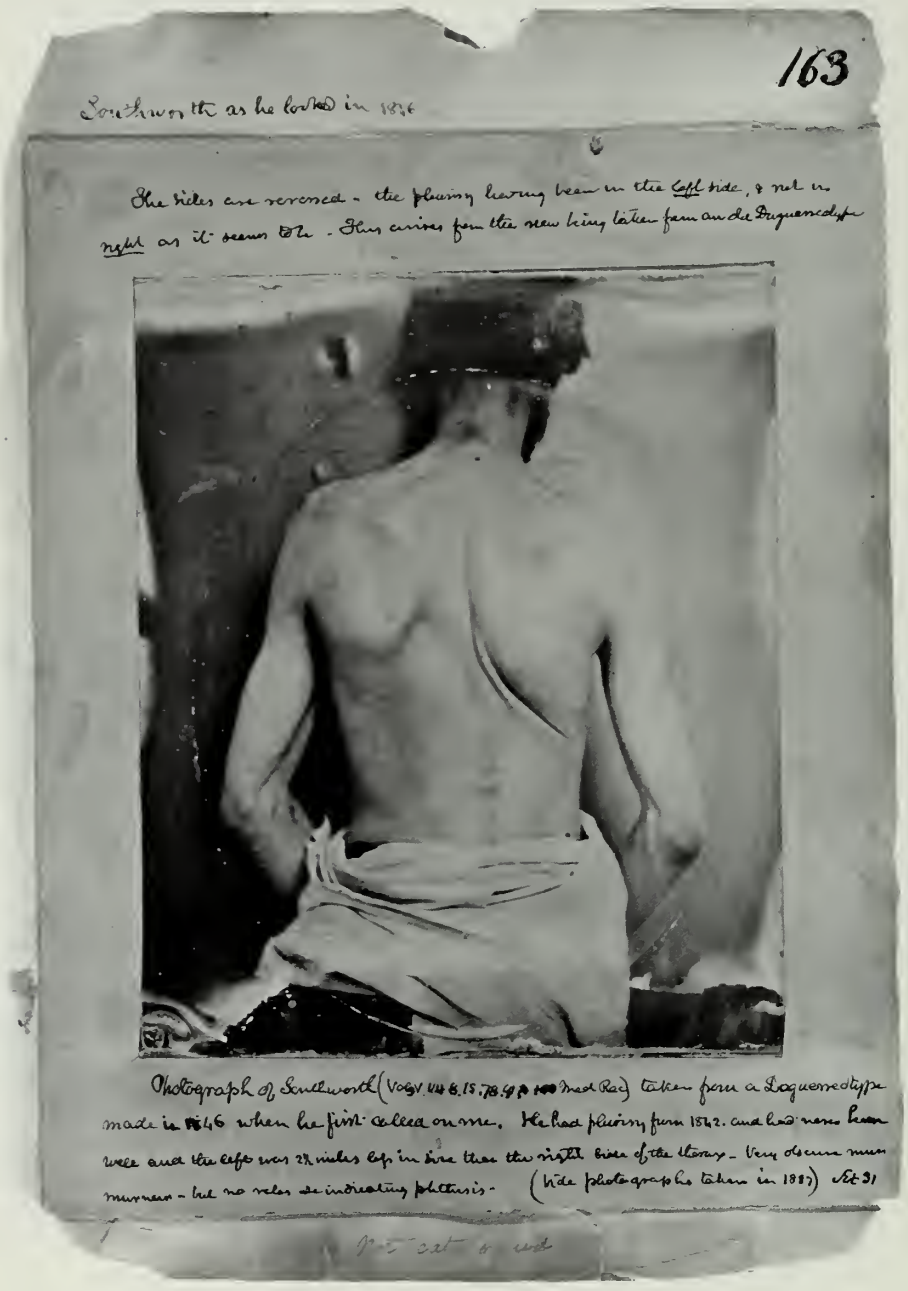
Unclothed poses of well children, adolescents and adults were taken by anthropologists, physical educationalists, nutritionists, and physicians to discover weak posture, short stature, flabby muscles and fat. Popular and professional



Opposite page: *Henry Pickering Bowditch's composite of the "Ideal Harvard Faculty" ca. 1890, based on photos of real Harvard Medical School professors, whose signatures also appear here.*

Student, 1890s, by Dudley Allan Sargent (1849-1924). Harvard University Archives.

At right: *Early plastic repair of nose by Henry J. Bigelow, MD, 1850. Photographer unknown. Massachusetts General Hospital. Since photography's beginnings, before and after views of surgical and orthopedic operations have been standard.* Bottom: *"Photograph of Southworth . . . taken from a Daguerreotype made in 1846." Photographer unknown. Countway Library. Patient is the noted photographer, Albert Sands Southworth.*



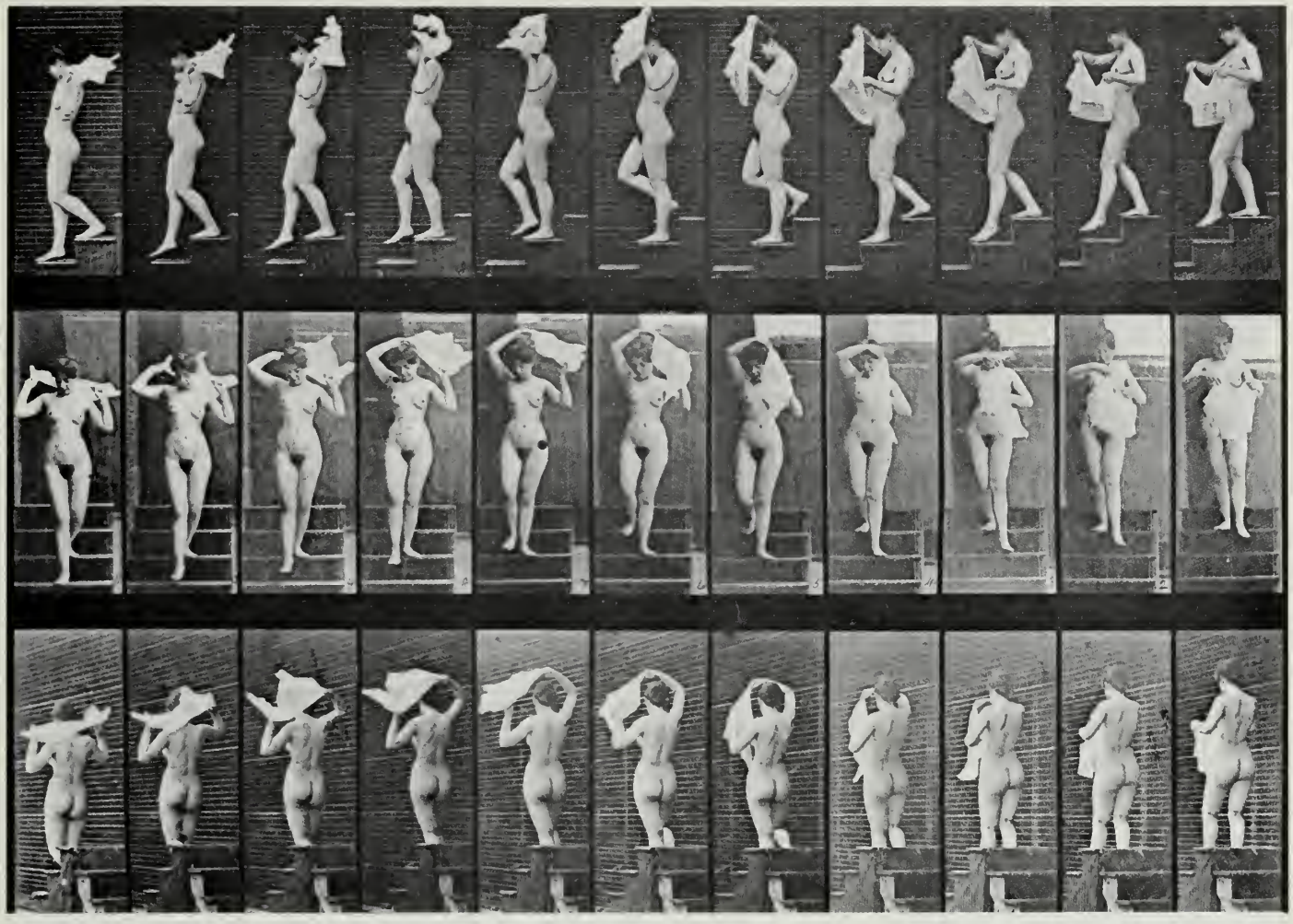
theories argued that proper posture, weight, and height defined the "normal" healthy body and that this physical condition could be achieved by proper exercise and nutrition. Photography of the body was also driven by the Victorian religious search and prescription for health, the notion of *mens sana in corpore sano.*

In the study of healthy bodies, Dudley Allen Sargent, a physician and director of Hemenway Gymnasium at Harvard College from 1878 to 1920, made three nude views of each entering freshman to assess those in need of corrective training; a practice, not incidentally, that continued into the 1950s, and included Radcliffe College.

Since the 1900s, it has been common practice of pediatricians and nutrition researchers to chart growth and development curves for normal children from measurements of height and weight. They often make photographic records of external morphology. For example, the Harvard College Grant Study was a longitudinal survey of "normal young (college) men" that attempted to document "masculine components and body disproportions." Such longitudinal population and group studies assessed posture and nutritional data by social status—with the middle class growing larger and standing taller.

In the 1940s, others, such as William H. Sheldon, a physician and psychologist in the Department of Anthropology, photographed similar body poses for the study of "constitutional psychology." This theory of psychology followed theories of phrenology of the 1800s, which argued that personality traits, even intelligence, could be read in the individual's physiognomy. Sheldon believed that ecto-, endo-, and mesomorphic body types indicated specific personality traits. From images of the body form, the reasoning went, a practitioner at a glance could size up the personality of the patient, which, in turn, could reveal the likelihood of medical disease—a correlation not subsequently supported.

The photographic collections also include many images of the bodies of deformed patients such as dwarfs or those with congenital anomalies, and those with rare genetic disorders outside the everyday clinical experience of the student or practitioner. Such infrequent abnormalities have been visually reproduced in photographs to illustrate medical instruction and to aid recognition in practice. In the 1930s to '50s, endocrinologist-investigators, such as Fuller Albright at the Massachusetts General Hospital and George Thorn at



"Animal Locomotion, Plate 133," by Eadweard Muybridge (1830-1904), ca. 1870s-1880s, published 1887. Museum of Comparative Zoology. Using multiple cameras with mechanically tripped shutters, Muybridge captured stages of movement in humans and animals. His images provided the basis for locomotion studies.

the Peter Bent Brigham Hospital, defined the abnormalities of hormonal secretions that were the basis of many genetic defects and diseases—for example Addison's disease, hyperparathyroidism, and Turner's syndrome. The unique physical appearance of each disease or genetic defect is easily recognizable in photographs.

Not only the rare but common diseases have frequently been depicted, for example, goiters, scoliosis and Pott's disease of the spine. Similarly, the numerous shots of patients with skin disorders by the Massachusetts General Hospital early photographer, Walter J. Dodd, were most useful in teaching students in the clinic and in illustrating the hospital case record.

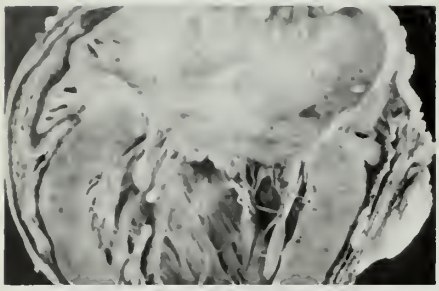
Not only the healthy and diseased body but the body under treatment has been a focus of medicine's science. Since the Civil War, military surgeons have pictured wounds and their repair, and before and after views of plastic and orthopedic operations have become traditional visual markers of surgical outcomes on body appearance and form, if not function. More recently, photography has been used for legal purposes to document injuries resulting from child and sexual abuse.

Not all photographs of the external body have been posed and static. The study of nonverbal behavior such as emotions, facial expression, posture and gait has required that photographs catch the messages of the body transmitted by its changing appearance, movement and position.

In the 1860s Oliver Wendell Holmes Sr., professor of anatomy, was an early enthusiast of "instantaneous photography," in which short exposures would freeze a movement of walking—efforts that preceded the animal and human locomotion studies of Eadweard Muybridge. In the 1870s bodily reactions such as blushing were photographed by physician and photographer friends of Charles Darwin to illustrate his study of the expression of emotions in humans and animals. Aristotle commented on this 2,000 years before, in his *Physiognomics*: " . . . some signs are better adapted than others to indicate the mental characters behind them. . . . The clearest signs are derived from those parts in which intelligence is most manifest [the region of the eyes and forehead, head and face]."

These and many other visual studies of movement have contributed to the understanding of communication between doctor and patient (such as that the physician's gaze stimulates the communication of feelings) to the design of rehabilitative equipment for the physically disabled, and to the engineering of machines and equipment that best fit everyone's form and function.

Besides these vast collections of classic medical images of the body's exterior, pathologists photographed the body's internal parts and their sections, since organs were so readily available from surgical operations and autopsies. Although the black-and-white prints of autopsy specimens taken by Walter J. Dodd (circa 1890s) and other hospital photographers never matched the real-



Top two photos: *Scarred and narrowed (stenotic) mitral heart valve, in a postmortem heart, 1935. Photographer unknown. Massachusetts General Hospital, courtesy of Dr. Edward F. Bland.* Bottom: *Echocardiogram of scarred and narrowed (stenotic) mitral heart valve in a living patient, 1988. Echocardiographic Laboratory, Massachusetts General Hospital.*

istic clarity of drawings and etchings made by medical artist-illustrators, photographs provided a quick visual rendering impossible for fine artists to achieve. Indeed, pathology texts and departmental slide-tissue collections feature photographs of every organ, postmortem or excised, and the cells that make them up.

In the last four decades, the modern electronic imaging technologies of computerized automated tomography (CAT-scans), magnetic resonance imagery (MRIs), positron emission tomography (PET), lasers, sonography, angiography, retinoscopy, and endoscopy have made possible inside views of the living body, including pictures of functioning organs and tissues. And while clinicians have been busy photographing and imaging the living body's interior organs and their cells, basic scientists (molecular biologists in particular) have been using the electron microscope to produce images of the most minute, mysterious parts of cellular machines—their molecular and genetic structures, DNA.

Structure and function are revealed. Medical science, as Michel Foucault observed, is nothing if not ocular.

While so many body photographs illustrate medicine as science, far fewer demonstrate medicine as art. The reasons lie in the nature of art and the limits of still photography. Clinical teachers admonish students to attend to the patient as a person, to learn the patient's perspective, to remember that, in the Hippocratic view, illness arises out of a unique, individual life, and thus to make a psychological diagnosis as well as a diagnosis of medical disease. The patient as a person and his or her subjective experience of being ill have resisted capture on film.

That medicine's art might even become a science and more easily documented was the hope of L.J. Henderson, physician and professor of chemistry at Harvard in the 1920s to '30s. Henderson believed that if the behavioral sciences could gain an understanding of the patient, the illness and the doctor-patient relationship, the proper caring acts and communication with patients could then be described, predicted and rationalized. Yet clinicians, before and certainly since Sigmund Freud and William Osler, have claimed only that knowing and caring for the patient, even if empirical, is medicine's art.

Social science or art aside, the patient is medicine's object and photographic collections of patients are numerous. But in actuality they are frequently the images of patients' bodies and their parts, abstracted by teacher-clinicians and researchers to enrich visually the teaching of biological science and medical diagnosis. Missing are photographs that might have been used to illustrate the patient as a person for instruction in medicine as social science and as psychosocial diagnosis.

Yet photographic stills have captured elements of the patient, the illness, and the doctor-patient relationship. The patient and illness have been viewed in the depersonalized abstract: a patient suffering, writhing with pain or dejected with grief; the relationship distilled into moments showing power (as the doctor stands, the patient lies supine), intimacy (as the doctor touches the body or sits close), and respect (as the doctor listens intently).

Images of medicine's art remain scarce; traditional photographic stills only show the evidence of disease and external distress. The patient's experience of illness is missing. A text is needed. Mark Rosenberg's *Patients, the Experience of Illness* (1980), a photographic anthology of scenes from the Beth Israel Hospital, includes captions for each photograph that explain what the patient is experiencing.

Medicine as art or social science and the patient as a person (with a life history and illness experience) have been best captured on film by the electronic imaging and sound of movies, such as the early reels of psychiatric interviews or instructional films and video tapes about the experience of illness and treatment. More frequently since the 1970s, videotapes of everyday medical interviews have been produced, which record visual images and the interaction of doctor and patient.

Such discourse and images reveal what the patient and the illness are like. Systematically used in clinical instruction, such tapes create a social scientific text of the doctor-patient encounter. They add a new dimension to traditional medical photographic archives, a more balanced view of medicine as art.

Photography has helped transmit knowledge through wide distribution of visual data about health and disease. Images of the patient's body and disease have traditionally been used in teaching, as illustration for patient medical records, and documentation in textbooks, such as the *Color Atlas and Synopsis of Clinical Dermatology* (Fitzpatrick, Polano, and Suurmond, 1983). Photographs frequently illustrate medical journal articles and case reports, like the Cabot Cases in the Clinical Pathological Conference Records of the Massachusetts General Hospital, published in the *New England Journal of Medicine* with graphic reproductions of the pathologic slides from operative and postmortem specimens.

Oliver Wendell Holmes Sr. called photographs "mirrors with a memory," and indeed they have often seemed more authentic than words. Besides illustrating medical records, texts, articles and lectures, these snapshots of the body can also be given to patients for their personal records or used in patient education.

Since the 1930s, medical photographs of the inner body, ultrasounds of the fetus, and videotapes of encounters in the office, the hospital room, and the operating suite have helped prepare patients for the experience of illness and

treatment. The explanation of illness is now visual. Photographs complement, if not supplement, the practitioner's words—or the clinical jargon—in conveying information about diagnosis, treatment and prognosis. Outside the office, medical photographs frequently illustrate popular texts, pamphlets and exhibits on health education for the public, and illustrate medical histories.

But medical photography is more than documentary, instructional or promotional. Medical photographs can have intrinsic artistic value, and make complex esthetic statements. Examples appear in medical advertisements and in illustrated books about medicine as science.

Archival photographs of scenes in institutional life of the teaching hospitals and medical school include: views of patients with staff, group portraits of doctors-in-training, and individual portraits of senior staff and managers. The camera has documented the diagnostic and therapeutic work of the hospital in its mission to care for and cure the sick, along with the laboratory work of the medical school in its pursuit of scientific investigation.

Photographs of the patient and hospital staff together from the mid-19th to early 20th century commonly appear in hospital archives. These institutional photographs (doctor and/or nurse at the patient's bedside) taken by staff for in-house use conveyed messages to those working within its walls about the hospital's mission of care. The hospital then was viewed as a custodial institution of last resort. With few promises of medical or surgical treatment, it was perceived as a place to die, hidden from everyday public view.

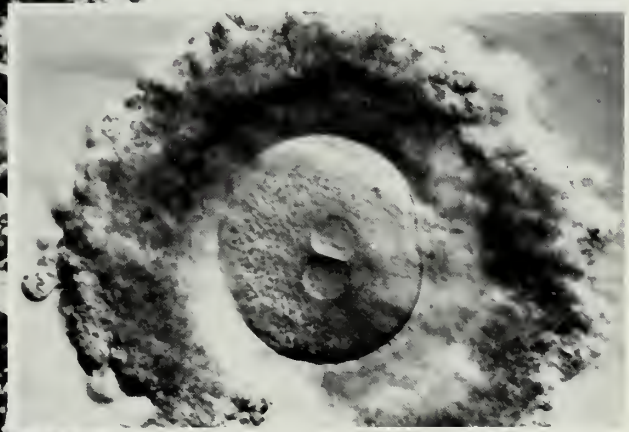
Even into the 1960s, the subjects in these scenes continue to be public-ward patients attended by nurses and resident physicians, rather than the private patient with his/her personal physician, both of whom were reluctant to have their private selves, rooms or relationship disclosed by an intrusive camera. Moreover, institutions were likely not eager to acknowledge their preferential care of paying patients.

Missing from the archives are similar views of ambulatory patients and doctors together in the medical office, that arena of private practice outside the hospital, with the exception of a few early office photographs of indigent children, and occasionally adults, with a nurse or doctor. These were taken at free-care visits to hospital out-patient departments and public clinics.

Like sickness itself, the encounter in the private office was indeed a private world of personal relations and considered off-limits to the camera until the late 1930s. FSA photographers then snapped views of doctors and patients in rural offices to promote federal medical care programs. Health and fitness were by then more visible public concerns for the war efforts.

In contrast, today's photographs of patients with or without doctors are numerous, since patients rarely refuse consent. Being looked at by doctor, camera, or diagnostic machines is a deeply ingrained visual expectation of the office medical encounter: "Doctor, I want you to see me." "Aren't you going to take a picture of my stomach?"

Early professional group portraits of medical students, residents, nurses and the visiting staff were mementos of professional life in the hospital. From the 1890s, the location of professional training inside the hospital permitted the camera to view students and resident physicians who previously had been



At left: *Scanning electron micrograph of sperm in the endometrium of the uterus, ca. 1980 by David Phillips. Harvard Medical School, courtesy of Don Fawcett '42.* Above: *Fertilized human ovum in its first stage of division, ca. 1980. Department of Reproductive Biology, Harvard Medical School. Brigham and Women's Hospital, courtesy of Ann A. Kiessling, PhD.*

Wax model of a baby with congenital abnormality, 1986, by Rosamond Purcell. Warren Anatomical Museum.

out of sight in apprenticeship with solo practitioners in community offices. For residents whose years of live-in training made the hospital a home away from home, formal group photographs celebrated their fellow residents, companions in the long hours and stresses of medical work. When residents went on to diverse and distant careers, prints from these times were kept as family or fraternity portraits—and also preserved in hospital archives.

Similar group views today provide glimpses of the extensive cast that supports trainees in their long-playing drama of "learning to become a doctor," an ancient legend, so popular in today's press and on television, as any scene from ABC's the "36 Hour Day" or the 1988 "NOVA" series on the Harvard Medical School's New Pathway curriculum will demonstrate.

Individual portraits of the hospital's senior staff serve as archival material, lifelong reminders of teacher-mentors, eventually displayed in the offices of graduates, or used in the biographies and autobiographies of physicians. Others became official portraits of the administrative-clinical hierarchy of doctors in charge of the institution—the chiefs of service and hospital superintendents (similar to today's hospital CEOs)—and decorated conference rooms and hallways.

Besides documenting patients and staff, photographs showed scenes of nurses caring for patients, of surgeons performing operations in their newly opened operating theatres, and of physicians doing physical or neurologic examinations. Initially, photographs of medical work, like the staff portraits, were in-house mementos, addressed more to the staff, hospital managers, and trustees than to the public at large. But by the 1920s, these views of professional work and the hospital's new diagnostic technologies had gone public in local and national newspapers.

Photographs were first used to promote the charitable work of the hospital in caring for the sick poor, then to gain public support for an institution that was no longer custodial but therapeutic and that provided care for everyone. Promotional photography showed the modern hospital of the 20th century offering treatment on an individual basis to the rich and poor alike. It promised private rooms and the latest technologies. Photographic views of diagnostic-treatment machines (such as radiation therapy units) depicted patients too, promoting the benefits the public might gain from the new technology and demonstrating what treatment the patient might experience in coming into the modern hospital.

With the passage of time, many views of medical work and institutional life provide a rich source of information about medical practices and have been used to illustrate histories of the development of the profession and the hospital. These old scenes continue to decorate the hospitals, while new views make up the promotional pages of hospital and medical school publications, celebrating care, treatment, education and research. Glossy brochures and annual reports depict the older tradition of care while advertising the modern technologies of today's competitive hospital-corporations.

In addition, public or in-house communications—Harvard Medical School's *Focus*, Massachusetts General Hospital's *Hot Line* and *News*, McLean *Review*, Brigham and Women's Hospital's *Inside*, Beth Israel Hospital's *Examiner*, New England Deaconess's *Pulse*, Mt. Auburn's *House Call*, The Cambridge Hospital's *Pulse* and *Vital Signs*, Children's Hospital's *Children's Today*, and Massachusetts Eye and Ear Infirmary's *Contact*—all print news and photos of staff, em-

ployees and patients. Photographs inform about hospital corporate life and recognize staff achievements, perhaps in an effort to recapture some of the sentiment of the hospital as "family" that has disappeared from the workplace of the modern academic medical center.

Archives began as storage areas for photographs and other memorabilia that hospitals accumulated over the years. Photographs were taken by staff photographers hired for special events and ceremonies, official hospital photographers, and more recently by staff photographers attached to public relations and news offices. Not surprisingly, images in the Harvard hospital archives now number in the tens of thousands.

The earliest medical archives at Harvard University were established at the teaching hospitals of HMS: Massachusetts General, founded in 1811, the Boston City (founded in 1850 but no longer affiliated with the Harvard Medical School), Children's Hospital (1869), Brigham and Women's (from the Peter Bent Brigham—1914, combined with the Boston Lying-In—1873, and the Free Hospital for Women—1875), Beth Israel (1927), and McLean (1811). Smaller photographic collections are at New England Deaconess (1896), Mount Auburn (1886), and Cambridge (1886) hospitals, while still more belong to the HMS Warren Anatomical Museum, the Countway Library, and the Harvard Medical Area News Office. Some photographic collections are held by departments, notably dermatology and pathology. There are also many collections maintained by individual hospital staff physicians, particularly orthopedic and plastic surgeons, radiologists, dermatologists and endocrinologists.

The archives contain thousands of illustrations of studies of disease for medical diagnosis and instruction. They illustrate signal events in the history of the hospitals and medical school, such as the introduction of new technologies, the opening of facilities for care and treatment, innovations in scientific research and changes in professional work, medical instruction, and patient care. As photography has become more widely appreciated as a means of artistic expression, the esthetic appeal of medical photographs, both past and present, is gaining recognition.

Looking ahead, the archives of the medical school and its teaching hospitals are likely to grow and diversify, augmented by the wealth of individual and departmental collections, videotapes made of clinical encounters, and documentary teaching films. With such additions the archives will continue to preserve invaluable historic records of medicine's art and science. □

John D. Stoeckle '47 is HMS professor of medicine and chief of medical clinics at Mass. General Hospital, where he is also director of the primary care program. Guillermo C. Sanchez '49 is HMS assistant clinical professor of medicine and a member of the editorial board of the Bulletin. *This article was adapted from "On Seeing Medicine's Science and Art: Cure and Care, Body and Patient" in the Harvard University Library catalog*, The Invention of Photography and Its Impact on Learning *(curated and edited by Melissa Banta and Louise Todd Ambler; distributed by Harvard University Press).*

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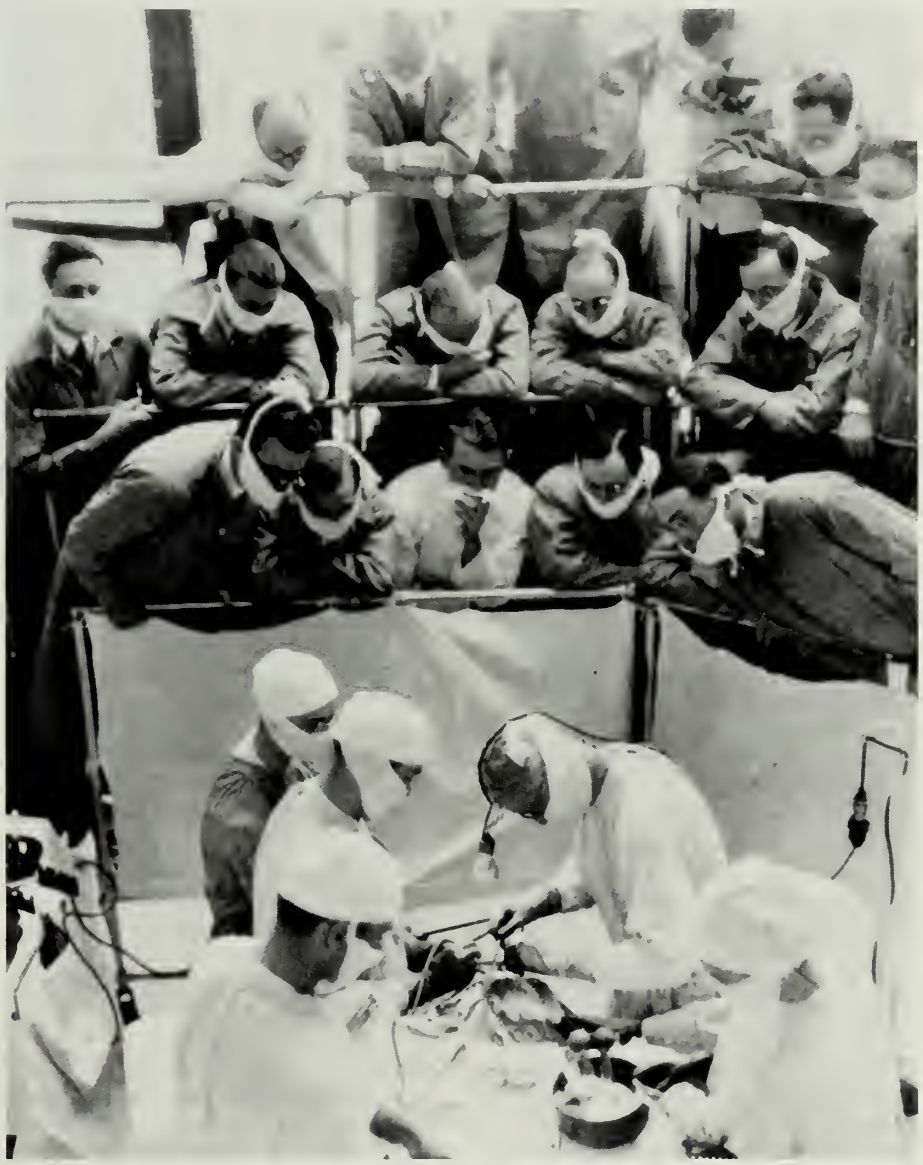


Harvey Cushing operating before the Cushing Society, 1932, by Richard Light, MD. Brigham and Women's Hospital Archives.

Francis H. Williams and the Roentgen Ray

The Seeds of Radiology

by Reginald Greene

PHOTOS FROM *THE ROENTGEN RAYS IN MEDICINE AND SURGERY* BY FRANCIS H. WILLIAMS, MD (THE MACMILLAN COMPANY, 1901). COURTESY OF COUNTWAY

Like many other young radiologists in training, I made a number of "personal discoveries" that I naively believed had not been previously known. Over the subsequent years of practicing thoracic radiology, however, I recognized that much of what I thought were new discoveries were, in actuality, rediscoveries of what had been well known to older physicians, such as the pioneer, Francis H. Williams of Boston. The origin of many of the verities of chest imaging were documented in Williams's writings almost 100 years ago.

Williams toiled in backroom laboratories and hospital basements like his many colleagues who had joined the race to apply Roentgen's discovery to medicine. Within these workmanlike conditions, Williams applied the Roentgen ray to his patients, and from these experiences taught the rest of the world about chest imaging.

With Antoine Béclere of Paris and Guido Holzknecht of Vienna, Williams made up a triumvirate of pioneers in chest imaging. In the first few years following Roentgen's discovery, each of these three physicians contributed prominently to medical papers on tuberculosis—the dominant scourge of humanity then. They frequently referred to one another's work, and each wrote a major treatise on the Roentgen diagnosis of chest disease in their respective languages.

These three were recognized internationally, though the two Europeans enjoyed greater and longer lasting national acclaim. The Bostonian, although perhaps the greatest pioneer teacher of chest imaging, is known to relatively few modern day radiologists.

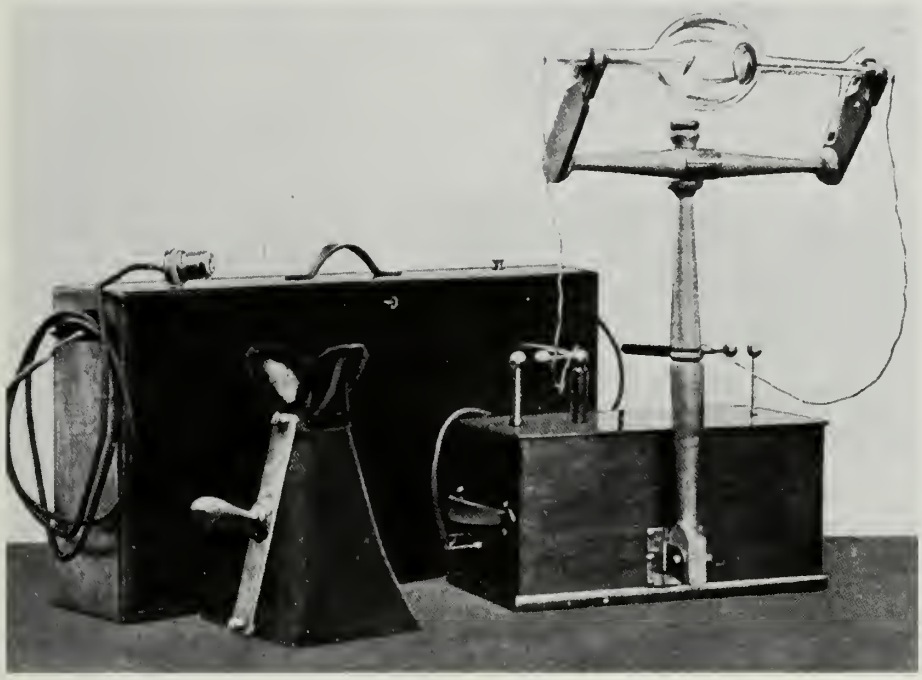
From Williams's writings we can learn much about what was known nearly a century ago, and we may recognize the origin of many of the analects that we are now so quick to teach our own students.

Williams was born July 15, 1852 to Elizabeth Dewe and Henry Willard Williams, MD in Uxbridge, Massachusetts. Williams's father, an 1849 graduate of Harvard Medical School, was the school's first professor of ophthalmology. The younger Williams entered Massachusetts Institute of Technology in 1869 and graduated with a degree in chemistry. After making an expedition to Japan to observe a solar eclipse by Venus as part of a trip around the world, Henry followed his father and elder brother, Charles Herbert, to HMS and graduated in 1877.

Francis made a two-year sojourn to Paris and Vienna following graduation. This European connection probably facilitated his later communication with Béclere and Holzknecht. Upon returning to Boston in 1879, Williams began his medical practice.

As events would later make clear, his position in the outpatient department of Boston City Hospital in 1882,

On facing page is Francis H. Williams (Class of 1877). Below is the portable x-ray apparatus for use on 110-volt house current, and the title page of Williams's 1901 book.



THE ROENTGEN RAYS

IN MEDICINE AND SURGERY

AS AN AID IN DIAGNOSIS AND AS A THERAPEUTIC AGENT

Designed for the Use of Practitioners and Students

BY

FRANCIS H. WILLIAMS, M.D. (Harv.)

GRADUATE OF THE MASSACHUSETTS INSTITUTE OF TECHNOLOGY; VISITING PHYSICIAN AT THE BOSTON CITY HOSPITAL, FELLOW OF THE MASSACHUSETTS MEDICAL SOCIETY, MEMBER OF THE ASSOCIATION OF AMERICAN PHYSICIANS; MEMBER OF THE AMERICAN CLIMATOLOGICAL ASSOCIATION, FELLOW OF THE AMERICAN ASSOCIATION FOR THE ADVANCEMENT OF SCIENCE, ETC.

WITH THREE HUNDRED AND NINETY-ONE ILLUSTRATIONS

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and his appointment to the MIT Corporation in 1883, were to contribute greatly to his ultimate ability to apply Roentgen's discoveries to chest diseases.

In 1891 Williams married Ann Dunn Phillips, the granddaughter of the first mayor of Boston, and the two of them made a home at 505 Beacon Street. The couple had no children. Mrs. Williams died in 1935 and Dr. Williams died one year later on June 22, 1936 in the Phillips House of the Massachusetts General Hospital.

Prior to the discovery of the Roentgen ray in November 1885, Williams exhibited a strong interest in clinical research. In 1893 he was the first in Boston to report on the use of the diphtheria antitoxin, produced that year at the Pasteur Institute in Paris.

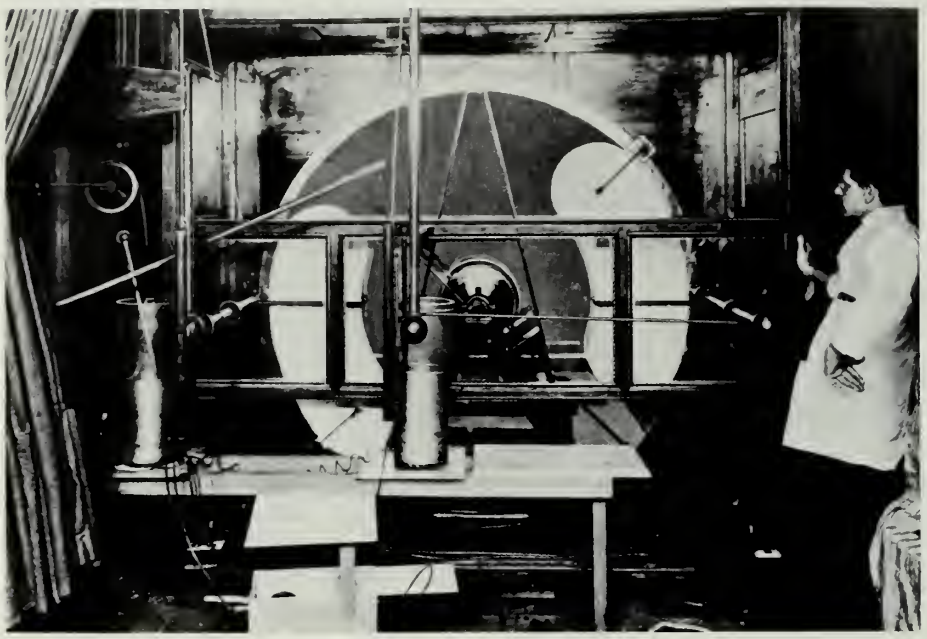
The report of the discovery of the Roentgen ray, however, forever changed Williams's medical career. Newspapers began reporting the discovery in Boston in early January 1896. Charles Cross, an MIT professor, was able to reproduce Roentgen rays in his physics laboratory. Cross permitted Williams to experiment with fluoroscopy and radiography in his lab and subsequently to bring in patients from Boston City Hospital for examination. It was at this point that Williams first began to make significant contributions to chest imaging. In 1889 grant money and space enabled him to start a radiology department in the basement of BCH.

It is hard to overstate the crude circumstances of the early attempts to produce x-rays. In general, the output of x-ray tubes was pathetically weak, requiring upwards of 45 minutes to expose a chest radiograph. Because of the long exposure, and the consequent poor chest detail of radiography due to respiratory motion, fluoroscopy was the preferred technique for chest diagnosis.

Most of the generators of the day were small static units and the power produced was in direct proportion to the size and speed of rotation of the glass disks. While many scientists and practitioners in Europe relied on relatively small hand-cranked Wimhurst static generators, with disks of 15 to 30 inches diameter, Williams was fortunate enough to have access to a large custom-built Holtz-type static generator with four rotating glass disks of six feet diameter, and four larger concentric stationary disks turning at 250 rpm. The apparatus was specially built for him by Charles R. Norton and Ralph E. Lawrence of MIT.

A brother-in-law, William H. Rollins, a dental radiologist and x-ray engineer, provided Williams with two great advantages over his contemporaries: a high output tube that used a metallic anode rather than the glass envelope as the source of the x-rays, and a safe lead-painted enclosure for the tubes. Williams described the lead-lined box

The crudity of the early machinery, however, did not detract from the elegance of Williams's early discoveries.



Large static machine with four revolving plates and four fixed plates. Front of case has been removed.

as allowing, "comparative few rays . . . [to] . . . escape . . . except through the hole."

It is notable that neither Williams nor his fellow workers were known to have suffered from any of the radiation injuries that were so prevalent during the early years of x-ray experimentation. Williams's machinery was much better than most but still primitive. The crudity of the early machinery, however, did not detract from the elegance of his early discoveries.

Williams relied on fluoroscopy for most of his chest diagnoses. When radiography of the chest was desired, the long exposure demanded that the patient lie horizontally still on a cot for upwards of 45 minutes. When bedside work or house calls were required, Williams would carry a small induction coil unit of 40 pounds that could utilize 110-volt standard house current. The radiographic detail rendered for still parts, like the bony structure, was much superior to what could be obtained fluoroscopically. But for moving parts, such as the heart and lungs, the advantage of film over fluoroscopy was generally lost by the long exposure.

Recalling that the discovery of the ray was unknown to physicians in Boston until January 1896, it is remarkable that on April 25, 1896 Williams delivered a report about the Roentgen diagnosis of tuberculosis in 40 patients at a meeting of the Suffolk Medical Society at MIT. Williams propagated these discoveries around the world through his writings and travels. He visited many colleagues in Europe and shared information with Sir James Mackenzie Davidson in London and Holzknecht and Béclere.

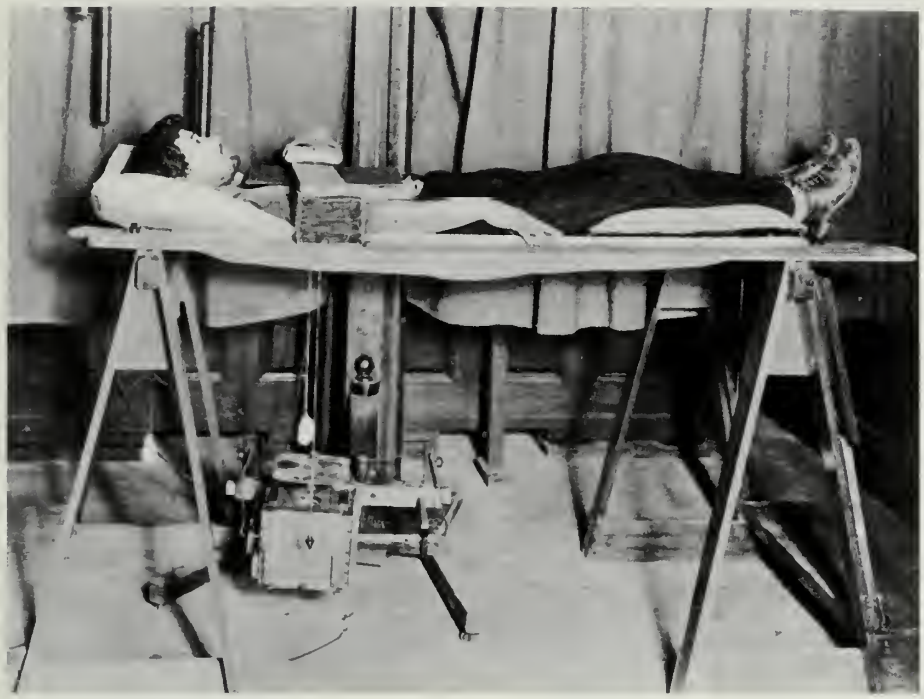
Williams's fame was greatly enhanced by the first edition of his book, *The Roentgen Rays in Medicine and Surgery* (Norwood Press, 1901). Béclere was so impressed with the text that he translated it into French. In addition, Holzknecht, in his own great German text, *Die Röntgenologische Diagnostike der Erkrankungen der Brusteingeneide* (Hamburg 1901), made many references and attributions to Williams's discoveries.

The first printing of the first edition of Williams's book sold out in three months. It contained 658 pages and 391 figures, of which 355 pages and 350 figures were devoted to equipment and examination of the chest.

Williams made many fluoroscopic observations in health and disease. He recognized the normal change in the fluoroscopic luminance of the lungs during respiration. He also noted the normal change in the shape of the heart and position of the diaphragm during breathing.

Williams recorded that most patients with early tuberculosis exhibited darkening of a lung apex, restriction in motion of the ipsilateral diaphragm, and slight ipsilateral displacement of the heart during expiration because of restricted expansion of the ipsilateral lung. He described tuberculosis of the lung in the living and in post mortem specimens. He monitored the progression and regression of the disease and recognized associated hilar adenopathy and miliary disease.

Williams cautioned that normal chest fluoroscopy did not exclude tuberculosis, but he also claimed that fluoroscopy could detect tuberculosis in patients with no or few clinical signs of disease. He found that fluoroscopy was more accurate than physical diagnosis



Method for photographing heart or lungs, with plate on front of chest.

in estimating the extent of disease.

On the diagnosis of congestive heart failure, Williams also made telling observations: "In passive congestion or oedema of the lungs in mitral disease, the lower portions of these organs may be darker than normal without giving signs by auscultation and percussion, but soon become clear after rest and the administration of digitalis," he noted. Williams recognized that tuberculosis could be differentiated from congestion by the latter's more rapid clearing.

On the diagnosis of pneumonia he noted, "A pneumonia in its early stages, or even through its whole course, may give no signs by auscultation or percussion, and the physician may find it difficult to make the diagnosis. In some of these cases a doubtful diagnosis may be made a more certain one with the use of Xrays."

It is difficult to improve on Williams's fluoroscopic description of emphysema: "The pulmonary area is more extensive and brighter than in health, and reaches not only lower down but higher up in the chest. The diaphragm is lower down in the thorax, and its excursion is restricted in the upper part of its usual movement. It sometimes happens that the diaphragm is so low down during full inspiration that it has a peculiar outline, this curve being made up of two curves on each side, instead of one, and following the organs directly under it.

"The cardiac outline . . . stands out with unusual clearness on the fluorescent screen. . . . The heart is lower down in the thorax . . . and its long axis is in a more vertical position. . . . The lower position of the diaphragm gives the axis of the heart . . . this vertical direction, and is one of the reasons why this organ when looked at from side to side, is at greater distance from the sternum in emphysema than in health."

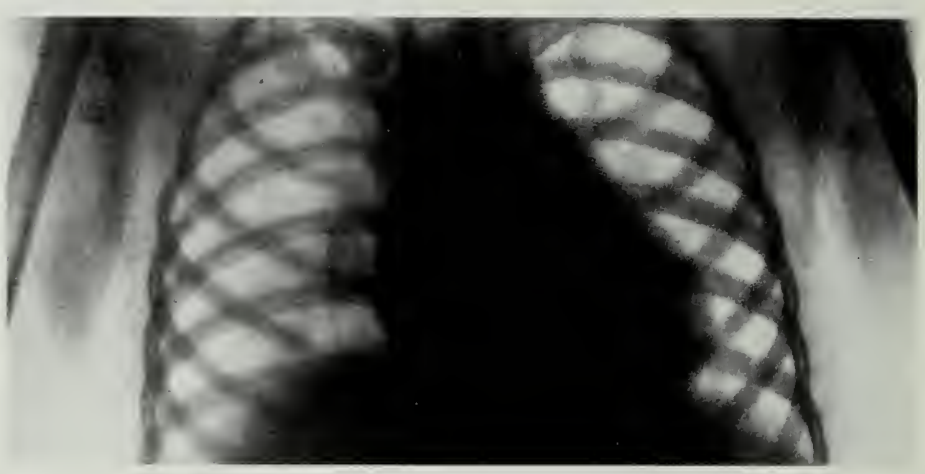
On the diagnosis of pleural fluid Williams noted that, "In pleurisy with effusion the outline of the diaphragm in the fluoroscope is less well defined, or obliterated altogether, according to the amount of fluid present . . . the outline of the dark area . . . may be seen to change . . . when the patient changes position."

Williams also noted that the excursion of the ipsilateral diaphragm is reduced and that the heart may be contralaterally displaced. Williams observed that marked contralateral mediastinal displacement and increased contralateral diaphragmatic movement could occur in massive pleural effusions. He recognized that, "The displacement of the heart caused by fluid in the chest . . . may be very marked and still not be detected at all by percussion, or if detected, its extent may not be accurately estimated."

In pneumothorax Williams observed that, "The affected side of the chest is usually clear, and the light area in this region is larger than normal; the lung is retracted; the diaphragm is pushed low down in the chest and has little or no movement, and the organs on this side are displaced to the opposite side. The amount of displacement varies according to whether the air in the chest is or is not under greater than atmospheric pressure; if air is pumped in during the respiratory movement through a valve-like opening, and the pressure in that side of the thorax is thereby increased, the displacement of the organs may be very great."

Williams clearly understood the flu-

Francis Williams had the good fortune of living during a period of opportunity, the access to superior physical resources and technical support, and an innate fascination for new technology.



Radiograph showing clavicles and front and back part of the ribs, with lattice-work effect.

oroscopic appearance of the air-fluid interface of hydropneumothorax. "The general appearances of this side may be likened to a tumbler partially filled with black ink; when the patient moves backward or forward, the level of the fluid changes; if he is taken by the shoulders and gently shaken, the surface is disturbed, and the splashing of the fluid is clearly seen. When the fluid is at a certain level, especially if the pneumothorax is in the left side, the pulsations of the heart disturbs its surface, and the waves caused by the partially submerged and beating heart can be observed."

It is interesting to look back at the circumstances that enabled Francis Williams to make his discoveries. He had many advantages over his colleagues: the good fortune of living during a period of opportunity, the access to superior physical resources and expert technical support, and an innate fascination for new technology that might help improve the treatment of his patients.

Williams's comments on the role of x-ray examinations in medical practice provide historical insight: ". . . the medical use of the Xrays should be in the hands of trained physicians . . . chiefly by those who make a specialty of thoracic diseases . . . they must learn to make and interpret these examinations, just as they have learned the use of . . . auscultation and percussion."

Williams went on to assert that, ". . . all medical schools should teach the method of Xray examination in connection with auscultation and percussion, even though the student should never have the opportunity to use this new method himself when he becomes a practitioner."

Nowhere is Williams's foresight more apparent than in his analysis of *in vitro* experiments that were concluded in 1896. Williams studied equal volumes of tissues in beakers and identified the differential x-ray absorption of the four major constituents of the body: water, bone, fat and gas. Recognizing that absorption was based on density, and that the density of blood was slightly greater than water, he tried to demonstrate a radiographic difference between the two.

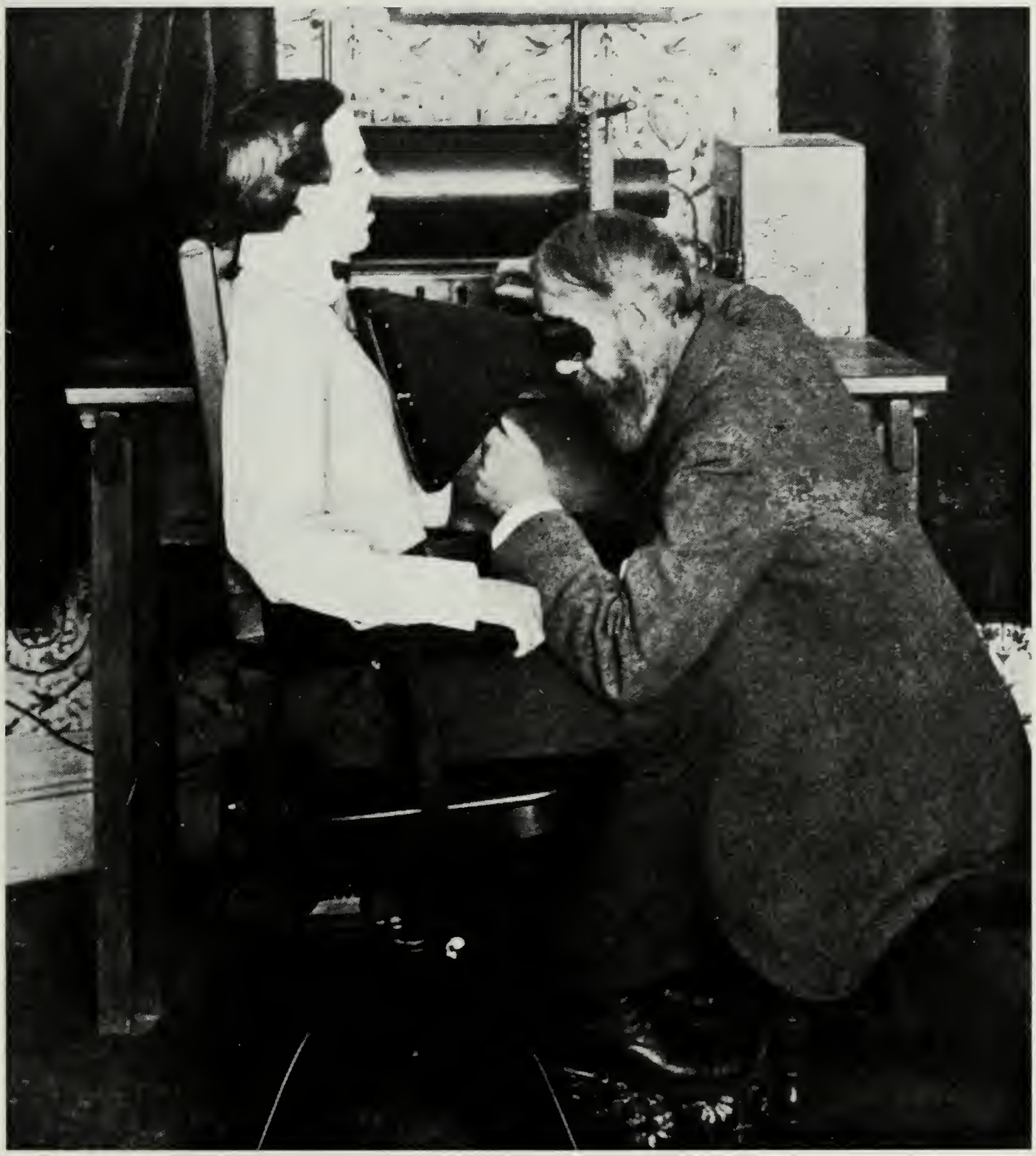
He was clearly disappointed by very slight radiographic difference, concluding that *in vivo* studies would not be sensitive enough to be useful in detecting the 1/2,000 difference in the weight of blood and water.

An insightful and slightly eerie discussion appears to presage the development of computed tomography and its ability to easily differentiate between the x-ray absorption of water and blood *in vivo*. Williams wrote, "This experiment suggests how we may recognize some changes in chemical composition made in the body by pathological processes. The ability to do this without a beaker or reagent, or disturbing the vital processes is a step in the application of chemistry and physics which hints at what the future may have in store for us."

Somehow I don't think he expected that we would have to wait so long for the development of nuclear medicine, computed tomography and magnetic resonance imaging to bring his prediction closer to reality. □

Reginald Greene, MD is professor of radiology at Massachusetts General Hospital.

This was the method of examining the thorax when a seated position was desired. The patient sat in a revolving chair with a leather back through which the rays could pass. The practitioner controlled the length of the spark-gap, the amount of the condenser, and the speed of the commutator; therefore he could vary the light to suit his needs as the examination proceeded.



Best Face Forward

New Ways to Navigate Craniofacial Surgery

by David E. Altobelli and Ron Kikinis

Our craniofacial team entered the final stages of the operative procedure on a young boy with Crouzon syndrome. I glanced at the clock behind the anesthesiologist and saw that it was already 8:00 in the evening—just 12 and one-half hours after our early-morning start. The operation involved reshaping the boy's forehead and upper nose. We needed to construct the orbits to provide protection and support for his eyes, and bring the middle face forward to correct an open bite, allowing the upper front teeth to contact the lower teeth for the first time.

Our "navigation system" during the operation was limited to the tools of our ancestors: rulers, calipers, and primarily the experienced "eye and feel" of the surgeons. To modify contours and fill in the gaps and spaces, we borrowed bone from the patient's cranium, ribs and hip. These differently sized and shaped bone grafts were trimmed and contoured by hand and eye, without the use of precision cutting instruments, and were integrated into the newly constructed anatomic form of the patient's head and face.

There are obvious difficulties when attempting to accurately orient and shape anatomic units and sculpted bone grafts. It is the skin surface and not the bone that the outside world sees, and the newly constructed bone framework is only an estimate of what the final facial contour will be when the swelling subsides.

As the procedure finally neared completion, a recurrent thought came to mind: "We must find a better way."

The effects of congenital and acquired craniofacial abnormalities are profound for the patient, the family and society. The human face serves a structural role for chewing, speech and breathing and it protects the brain and most of the vital senses. The face is also the primary interface for communication and psychosocial interaction. Construction and/or reconstruction of this complex region of anatomy commands high priority.

Young children with misshapened heads and twisted, disproportionate faces present a significant and daunting four-dimensional challenge. Current treatments first attempt to establish a more normal three-dimensional anatomy based on functional and esthetic considerations. Growth and development, however, the fourth dimension in this equation, is the much more elusive entity. The relative lack of knowledge we have regarding normal mechanisms of growth is further complicated by even less information on the etiology and mechanisms of the deformity.

Advances in craniofacial surgery can provide dramatic results by repositioning anatomic structures into more normal, functional positions during surgery. Nevertheless, there is continued abnormal development of the craniofacial skeleton as the child grows into adulthood. Often, additional major operations are required to again establish more normal appearance and function. But because the final operative procedures are often delayed until skeletal maturity is reached, the child continues to be subjected to the psychosocial pressures related to his/her different appearance.

Currently, surgeons use a standardized approach to collect qualitative and quantitative information for diagnosis,

CT images of the head. From standard CT slices it is possible to generate a three-dimensional surface reformation of the craniofacial skeleton from different vantage points.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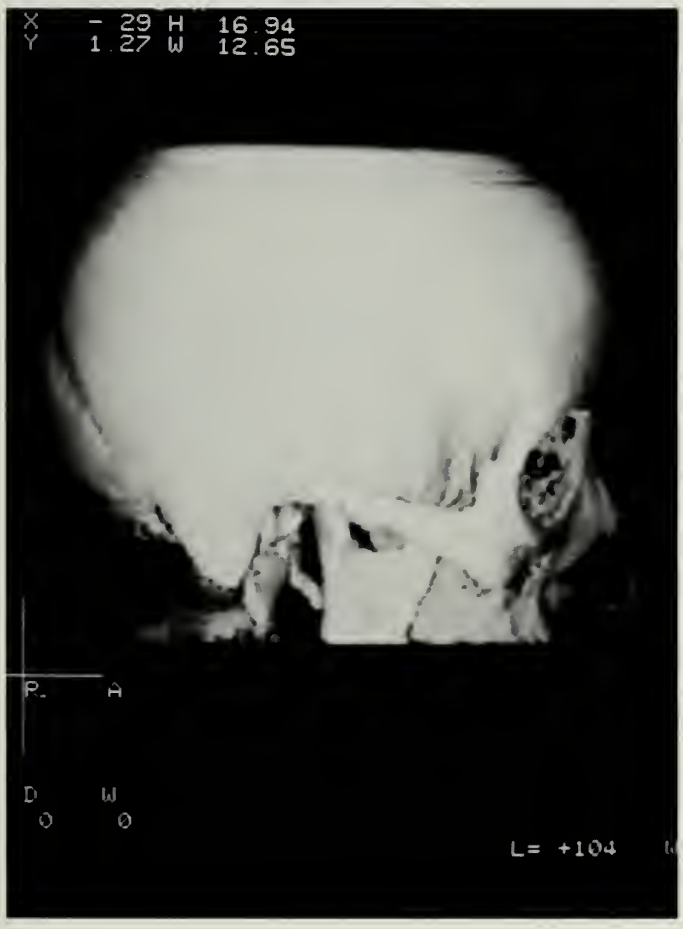
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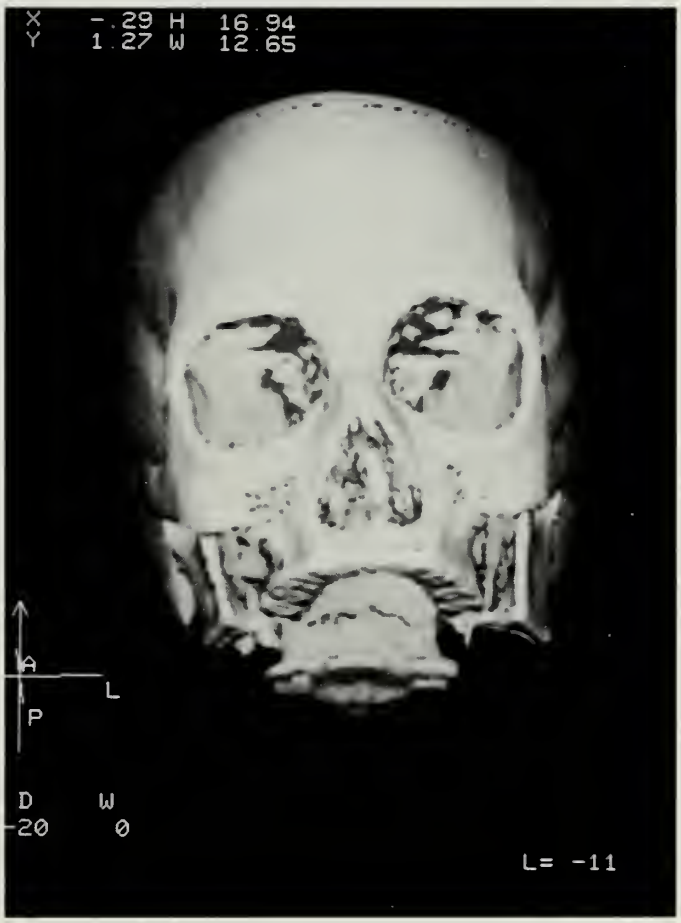
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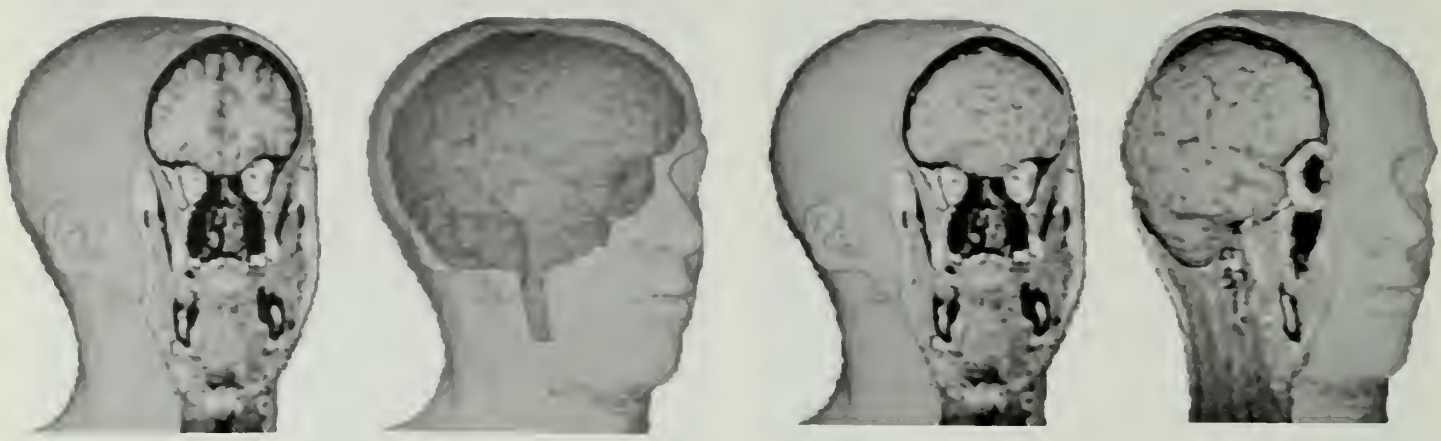

analysis and treatment planning. This information, organized into a data base, is assembled from basic anthropological measurements (linear distance between facial anatomic landmarks), photographs and standardized plain film radiographs from the side and front of the skull (also know as cephalometric radiographs). Dental models and jaw/occlusion relationships are also obtained. Required in more complex cases are CT scans, reformatted 3D-CT, facial models (moulage) and MRI scans.

Although specific details of a deformity can be studied by these multiple imaging modalities, these data are in a fragmented format with no common frame of reference to unify the information. Similarly, the limited anthropological measurements and cephalometric analysis of the standard radiographs provide some quantitative basis for analysis of the craniofacial deformity, however, these data are only relative relationships between limited numbers of points, and they do not provide a comprehensive, three-dimensional blueprint of the anatomy. This information provides a means of comparison to averages of skeletal relationships, but the relationships are often distant from the complex geometric description of the abnormal anatomic structure and are thus only of limited help in designing the operative procedure.

Because of the limitations of our current approach, three-dimensional and comprehensive methods to image the craniofacial anatomy, with numerical representation of hard and soft tissue structures, must be adopted. Lord Kelvin nicely sums up the importance of measurement as the very essence of science in the following quotation:

I often say that when you can measure what you are speaking about and express it in numbers, you know something about it . . . but when you cannot measure it, when you cannot express it in numbers, your knowledge is of a meager and unsatisfactory kind. It may be the beginning of knowledge, but you have scarcely, in your thoughts, advanced to the stage of science . . . whatever the matter may be.

The craniofacial biological system that commands growth and development is complex and currently well beyond comprehensive quantitative description. Combined approaches based on biological and engineering principles, however, have provided significant advances in medical research, diagnosis and treatment. Advances in computer technology, largely driven by the aerospace, automotive and telecommunications industries, are providing spin-offs in the biomedical sciences.

Computerized imaging has revolutionized radiology in the last 10 years. Previously, normal and abnormal anatomy would have to be mentally dissected from shades of black on a transparent film that represented the overlay of all the structures in the path of an x-ray beam. Computed tomography, which shows individual points along the path of the x-ray, is a computer synthesized digital image that is derived from x-ray attenuation or absorption from multiple directions. Although the hard and soft tissue anatomic structures can be viewed individually without superposition artifact from their neighbors, the data can be more difficult to examine because the information is represented as cross-sectional "slices" of anatomy.

Experienced clinicians can reconstruct this series of slices in their "mind's eye" to comprehend the basic three-dimensional shape and position of the anatomical structures. Yet complex structures and subtle malformations of hard and soft tissues traversing several slice levels are often too intricate to reconstruct mentally. Therefore, it is desirable to reassemble this mosaic of anatomic sections back into a complete image.

An important prerequisite to allow reformation of these data into a three-dimensional anatomic representation is the ability of the computer to automatically distinguish the specific tissues and structures of interest. This task is more straightforward in the case of CT imaging of bone. Since CT is based on x-rays, the dense mineral contained in bone has a characteristic signal intensity range. Commercial software programs are available to generate three-dimensional renderings of skeletal data, with selected views from multiple viewing angles provided on film for the clinician to review.

MRI, based on the magnetic resonance effect described in the 1940s by Bloch and Purcell, is a more recent medical imaging modality. It can provide enhanced discrimination of the soft tissues non-invasively without x-rays. Under the simplest circumstances in clinical MRI, signal intensity of a point in the anatomy being studied is determined by three tissue-specific parameters: T1 time, T2 time and proton density.

MRI can be used to highlight almost any tissue in the body. For clinical purposes, MRI is a balanced sequence that provides optimum contrast for several tissues simultaneously. The anatomic data is then represented as a series of computer-synthesized digital images, like slices, again circumventing the problems of superposition. Initially to the surgeon the images may look similar to CT scans, however upon

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Opposite page: *MRI of the head. The image is displayed in both cut plane and surface rendered formats to provide different vantage points for data interpretation. This presents information in one comprehensive image that otherwise would be distributed over many image slices.* At right: *Illustrated rendition of a child with a craniofacial deformity.*

closer examination, the skeletal landmarks that we normally use for orientation are dark instead of bright white as with CT images. What really becomes obvious is the tremendous detail and discrimination seen with the soft tissue structures.

Although serial MRI images can be reformatted into three-dimensional representations of the anatomy, thresholding techniques used with CT data sets are not adequate to discriminate tissue structure and boundaries in MRI. More advanced image processing techniques are required to transform serial MRI images into three-dimensional reconstructions.

The different tissue types at each slice level are discriminated, or segmented, based on their characteristic signal intensities in T1 and T2 images. Methods are then used to determine how similar tissues are related through sequential slices.

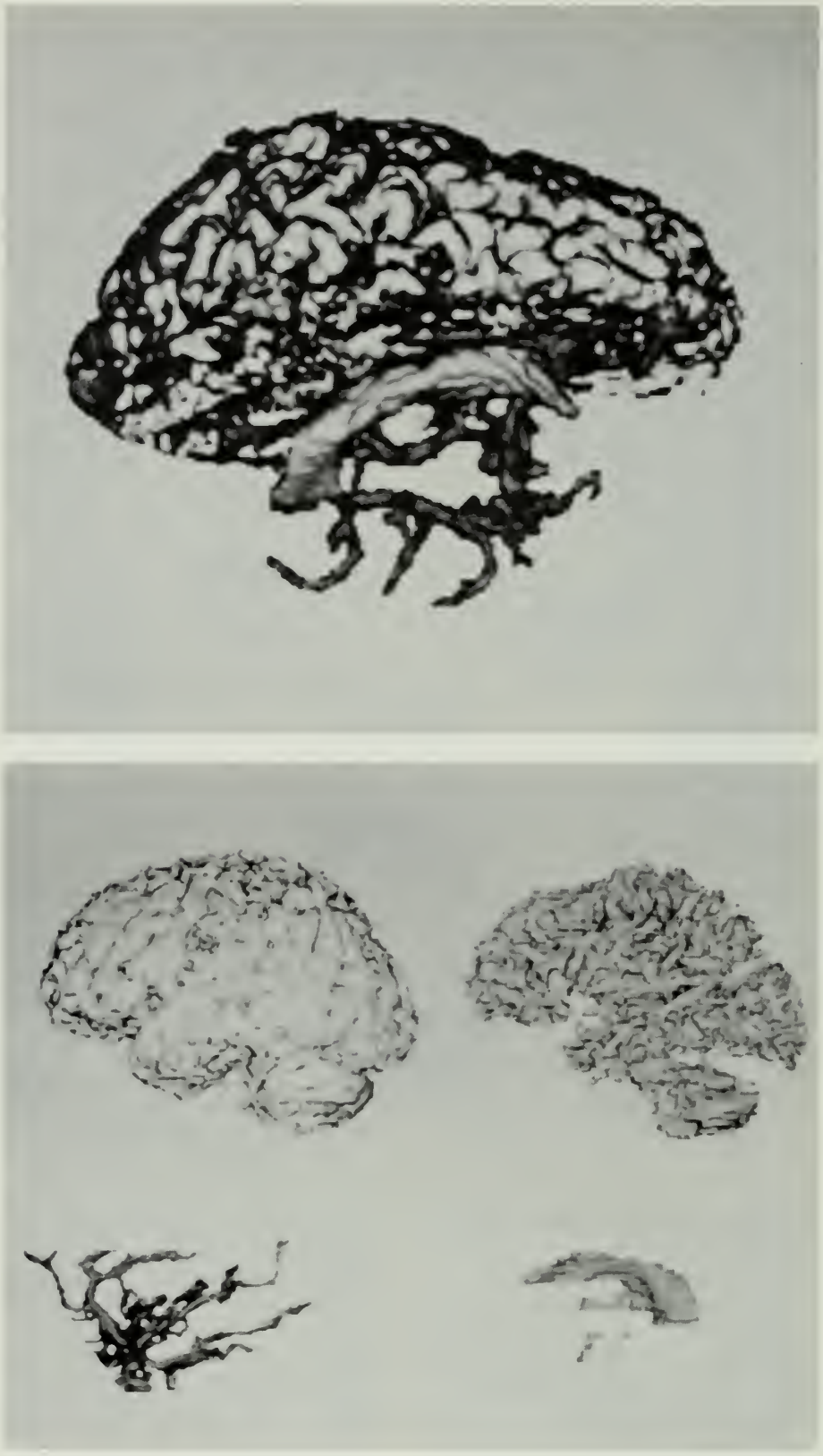
Finally, the surface of each organ or tissue structure is determined and then represented in a composite image where each tissue is discerned as a colored object. Objects can be viewed individually or superimposed as composite structures. Control of object opacity allows outer structures to appear transparent so inner structures can be viewed. Shading and perspective provide the perception of depth and three-dimensionality.

Although the medical data are manipulated numerically in three dimensions, that information must eventually be displayed as a two-dimensional projection of the anatomy onto the computer screen or a piece of film. The "feeling" of three dimensions is portrayed by shading and perspective. The field of true three-dimensional display is still in its infancy and holography is one of the most promising methods currently available to present complex three-dimensional imagery.

A hologram can be thought of as a window frozen in time, with the entire panoramic scene that could normally be seen from any vantage point represented and stored in the glass. When a hologram is made, it captures an "instant" of the pattern of light emitted from an object. Later, when the hologram is viewed, the holographic material continuously replays that pattern, precisely mimicking the object's appearance and thus producing the illusion that the object is still in its original position.

Each piece of the hologram records a different view of the object; the observer need only move to a different position in relation to the hologram to view the object from a different vantage point. Thus, in contrast to using a computer and image display software with a mouse and keyboards, a hologram will provide an easy and natural method for looking at the object image.

The earliest display holograms could only be viewed under laser light. In 1968 Stephen Benton, now director of the Media Lab at MIT, developed the "rainbow" hologram that could be viewed in white light. This breakthrough opened the door to widespread public exposure. Since then, holographers have developed ways to make holo-



MRI of the head. Structures such as the major arteries, white matter, gray matter, CSF and ventricles are discriminated (below) from the original cross-sectional composite image at left.

grams not just of real objects, but also of synthetic computer-generated images, i.e., medical images.

Further development will permit holograms to be inexpensive and portable snapshots of the complex three-dimensional databases of CT and MRI scans. In the future, holographic printers will be of comparable size and price to today's laser printers and true three-dimensional holographic video displays will be an essential component of scientific workstations and physicians' consoles.

Although computer reformatted, three-dimensional images currently provide "pretty pictures" and give the surgical team a subjective "feeling" for the anatomy, it would be more advantageous for the team to interact with the three-dimensional anatomy in "real time." CT and MRI data sets already contain an extensive, quantitative, three-dimensional description of the anatomic structure. Now, for the first time, the computer can generate a virtual window that shows the detailed anatomic structures of the patient, allowing us to accurately extract morphologic information.

Even though quantitative data to describe skeletal morphology is represented by the image, current techniques are limited in their ability to extract, manipulate, and analyze this data. We now need to develop a standardized method to describe the complex surface and volumetric relationships of normal anatomic form before comparison can be made to anatomic deformities.

The study of our anthropological history and much of our current understanding of craniofacial deformities has been derived from the hard tissue skeleton. This bias has been mandatory, for it is the skeleton that has persisted over the eons of time and that could be imaged using previous medical technology.

Recent work has shown that the bones of the craniofacial skeleton are not programmed to grow into a characteristic shape, but rather are passive and respond to signals from the soft tissue elements or functional matrix. MR imaging methods, which allow high resolution discrimination of the soft tissue anatomy, will provide an exciting vantage point to study the functional matrix. Image processing is being applied to allow imaging of the bone simultaneously with the soft tissue ele-

Accurate positioning will some day be accomplished by virtual imaging techniques that would simulate the surgery in a fashion analogous to a fighter pilot on a simulated training mission.

ments from MR studies. Comprehensive representation of the anatomic data may soon be possible.

As methods to access the quantitative description of the hard and soft tissue anatomy are developed, they will provide a way to study the morphometric (size and shape) nature of normal growth, craniofacial deformities and the effects of biomechanical factors on skeletal morphology. These data will provide the foundation for the development of alternate treatment methods to modify or correct abnormal growth in the craniofacial region. Currently, research is under way to use strategically directed forces across sutures and osteotomies (boundaries between bone, cuts in the bone) to reposition large skeletal segments by modifying growth and synthesis of hard and soft tissues with minimal surgical intervention.

From the clinical standpoint we will be able to formulate a more detailed and quantitative diagnosis and preoperative surgical plan using new forms of imaging. Surgical simulation will allow more detailed planning of osteotomy sites, analysis of anticipated positions of the skeletal and soft tissue elements with comparison to normative data, and the analysis of functional and esthetic parameters.

From this "dry run" of the operation, different approaches can be evaluated by the craniofacial team. A map of the osteotomy sites will be determined, the translations and rotations of the skeletal units outlined, and templates and implants can be designed and fabricated using CAD-CAM techniques (computer aided design and manufacturing)—all before any incisions are made.

A method for intraoperative navigation will need to be developed to allow accurate positioning of the skeletal segments and implants. This will be done initially with a three-dimensional positioning device, and later will be accomplished by virtual imaging techniques that would simulate the surgery in a fashion analogous to a fighter pilot on a simulated training mission.

At the same time, three-dimensional image data will be accessible in the operating room to allow the surgeon to preview images of the dissection or osteotomy and make mid-course modifications if needed. Clinically, this potentially translates into a more efficient, directed approach. The new images would allow for a more accurate placement of the skeletal segments, prefabrication of bone substitute implants with less requirements for bone grafts, decreased patient morbidity with the reduced surgical exposure time, and an optimal functional and esthetic result. Restoration of a more normal pattern of growth and development will result from greater understanding of the deformity, and new approaches to treatment will allow controlled modification of the craniofacial skeleton.

Integration of high technology into our current treatment approaches will require the collaboration of multidisciplinary teams from engineering, computer science, imaging sciences and processing, biology, surgery and radiology. Computer-based methods of imaging and modeling to simulate the biologic system will provide the core technology.

Although the development of new technology will always be a driving force, the application of existing technology will provide innovative new approaches to current important clinical problems. People, technological support, collaboration and funding will be important components to move this project forward. The surgical benefits will reach well beyond the solution to problems, the development of a new method or a greater understanding of biologic mechanisms. The real benefits, however, will reach our patients, whose faces are the window to their heart and soul.

With the head bandage in place, we transport the patient to the recovery room. The vital signs are stable and the patient tolerated the procedure well. The parents are probably exhausted from the anxious wait, filled with optimistic and fearful thoughts. As we enter the waiting room to talk with them, a feeling of tremendous satisfaction pervades our entire group. Yet, we also know that the child will require another major operation as a young adult.

My drive home that night seems long but peaceful. Random thoughts surface between the yawns and noises from my stomach. As I relax at home near the end of a long day, the focus of our future directions congeal. The problems have been defined, the technology has arrived, the talent and resources are around us. To begin is often the greatest obstacle in the journey. We have begun. □

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Final Decisions

DOCUMENTING DILEMMAS NEAR DEATH

Into that gray area where prolonging life is the same as prolonging death, Frederick Wiseman dares tread in his latest documentary, *Near Death*. Filmed two years ago in the medical intensive care unit of Boston's Beth Israel Hospital, *Near Death* is a riveting reminder of some of the dilemmas wrought by high-technology medicine. Viewers are privy for almost six hours to moving and intimate moments in the care of patients for whom medicine has no more options, and for whom withdrawal of treatment must be considered.

by Ellen Barlow

Wiseman has produced 24 films, starting with *Titicut Follies* in 1967 and including *High School, Basic Training, Welfare, Law & Order, Hospital* and *The Store*. Most of his films deal with institutions, and through them he is painting a picture of contemporary American life.

"Someone once told me that 80 percent of us die in hospitals versus in the past when most died in their homes," says Wiseman. "The way people die is obviously an important aspect of life."

He says he uses film to look at what's going on in the "real world" as opposed to the fantasy world in fiction. "The way I approach film is a combination of fiction film technique and journalism, using a dramatic structure."

The hand-held camera has made it possible for him to shoot with an almost fly-on-the-wall invisibility. "My effort is not to reinforce cliches, but to undermine them." He wants viewers to get immersed in the subject, in this case, "to really feel what it's like as a doctor, a nurse, a patient."

Comments Mitchell Rabkin '55, president of the BI, "I think the film captures people in the MICU doing what they ordinarily do with the requisite sensitivity we stand for. I'm also very proud of the professional interactions between doctors and nurses. It's hard to tell at times who are house staff and who are nurses." From the beginning Rabkin was firmly behind the project because, he says, few people know what really goes on in hospitals. "The staff in this film are not the television Nightingales or 'Doogie Howser'."

The film focuses on four seriously ill patients who were in the MICU during the six weeks Wiseman filmed. Only one woman of the four patients is still alive. There is no narration. Action centers on discussions in rounds; on tactful, frank talks with patients or their families; on nurses' meetings. The tone is mostly somber. No one is getting good news.

Nor are physicians making the kind of quick decisions seen in Hollywood depictions of emergency rooms. This film is about the slow process of decision-making. There's a lot of agonizing over when enough is enough, candid declarations that a patient might have three days or three weeks to live. Are all these med drips really necessary when nothing is doing any good? Is a terminally ill patient better off not being reintubated after six times on and off the ventilator, even if that decision might mean death? Is the patient just being kept alive until his family can deal with the end?

The families are each brought in on the decision-making. The families or, if able, the patients listen to the doctor or nurse's carefully chosen words. They're

Scott Weiss, MD (far right) conducting rounds in "Near Death," a six-hour documentary filmed at Boston's Beth Israel Hospital.

hearing the unthinkable—that they or their loved ones probably aren't going to make it.

The hope that Wiseman and the health care professionals involved in the film have is that it will help prepare people better for some of the dilemmas that high-technology has created in wake of its miracles.

Richard Pasternak, MD, HMS assistant professor of medicine and head of the BI's Cardiac Care Unit, first suggested to Wiseman, a fellow Cantabridgian and acquaintance, that he do a film at the BI on "high-tech dying." Wiseman had thought of the concept before and was very receptive.

"I've been increasingly interested in the ethical dilemmas in critical care settings," says Pasternak. "It's a never-never land. People see 'Marcus Welby' or 'St. Elsewhere' and are not prepared for what it's really like. Professionals are not prepared either, though are better prepared, as the film clearly shows."

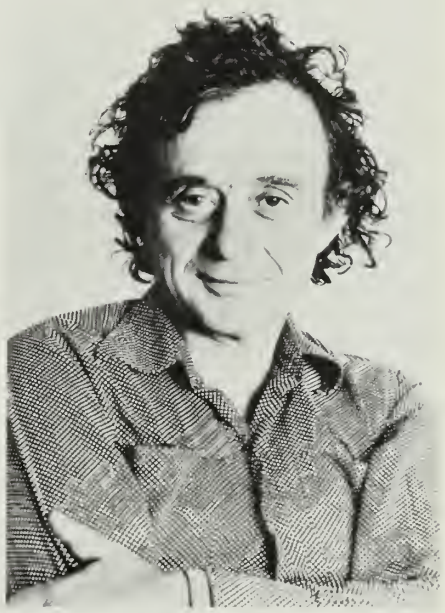
Modern-day death is different, Pasternak points out. The old notion was a scene from "Gunsmoke," where Pa slipped away surrounded by his loved ones. "Death is not like that," he says. "We don't know exactly when it will happen. We have definitions, but even death is a gray area—dead is when the brain stops, when breathing stops, but what if on a machine?" There's a scene in the film of a dynamic discussion among the MICU nurses. A patient has been brain dead for days, but is kept on a machine at the son's request until he can fly in. As one nurse says in the film, it only adds to the confusion when they are still "caring" for a "dead" patient.

People have unrealistic expectations about new technology, says Pasternak. "They come into what looks like a space station and are convinced that all this technology can take care of them. Technology is in reality only a good tool."

The film also shows the medical staff grappling with questions about when it is reasonable to discuss discontinuation of treatment. "In those discussions the notion of hopelessness comes up. It is important to see that hopelessness is not binary—hopeless or not hopeless. Like so many things, hope is on a spectrum. At best it is a percentage you guess at."

Hope, though expressed more often when breaking hard news to patients' families than by the professional staff among themselves, is an underlying force in the film. It is held on to by a thread, it is dashed, but hope and its counterpart, hopelessness, come up again and again.

"No situation is hopeless," says William Taylor, MD, a member of the division of general medicine and primary



Frederick Wiseman

care at Beth Israel, who figures prominently in the film because two of his patients were among the four Wiseman was focusing on. "The question is how little hope are you willing to accept to be put through all the medical and technical interventions." As Taylor is heard saying a couple times in the film. "There's always reason to hope, but it's looking worse and worse."

Taylor had known these patients and their families for years. "The irony is that in midst of this incredible technology, it happens frequently that the caring relationship is the basis for almost all I have to offer. The challenge in these situations is making sure that too much isn't done. When is the likelihood of helping so small that it's outweighed by the burdens of our interventions?"

Another fine line that physicians must walk, points out Taylor, is between paternalistically making judgments for the patient and, on the other hand, "brutalizing people with decisions they shouldn't have to make in an effort to include them in responsibilities that are really ours."

He cites one of the scenes in the film that he felt was most moving: a young man with a wife and three children is dying of respiratory failure due to a toxic reaction to chemotherapy. He's been on a ventilator for three weeks, unconscious. The situation has been explained to the wife, and she is asked if he should be resuscitated or not. She's heard talking on the phone, agonizing over the decision: "He's getting worse. They want me to make a decision about shocks if his heart stops. But I can't make that decision. He's too young. I want him to have a chance to live."

"Was this a fair question to ask her?" Taylor wonders. "She feels put in the position of deciding whether to let him die. She should be involved in the decision-making, but to what degree? How do we find out from people what they want in a way that is not overwhelming or brutalizing?"

But as a nurse comments at a nurses' meeting in the film, sometimes when a patient or their family says "do everything," they're not aware that "everything" means shocks, pounding on the chest, tubes down the throat, lines in the neck. Says Taylor, "We can explain things carefully, but what we really need to do is to tune in to how the patient is hearing the question."

How well physicians in general do in these situations is extremely variable, according to Taylor, who is an assistant professor of medicine and senior fellow for the HMS "Patient/Doctor" course. He says that without such courses, in which there is an explicit attempt to deal with death and dying, or organized efforts to teach in residency, physicians sink or swim on their own. "Many develop a great capacity to address these issues and others don't."

As the attending physician on the MICU the month Wiseman filmed, Scott Weiss, MD, who is also a pulmonology researcher in the Channing Lab, is ever-present in the film. He believes that the film is a model for how to deal with these issues. "We are in a different stage as a society and culture—most people want some control over life and fate, and want honesty on the part of the doctor."

Weiss also thinks that the film provides insight into how physicians feel about death and dying. "If you're emotionally neutral you ought to get out of the business. But it is important to recognize our feelings and how they effect care of our patients."

At one point in the film he describes his work as like "rolling the rock up the hill and having it come down again."

Comments Weiss: "When dealing with very ill patients you have to be strong enough to tolerate that you will lose a lot of them.

"I believe that helping people make a graceful exit is as important for a physician as saving lives. I don't believe that death should be painful and miserable. Most important is that a person's integrity and autonomy is recognized, even if hooked up to 10 machines."

It is Weiss whom viewers of the film hear expressing many of the quandaries: "Two-thirds of health care costs are incurred in the last 21 days of life. And the problem is that we can't tell who is going to make it and who is not."

And near the end, in a particularly heart-to-heart discussion with a resident: "A lot depends on how [the situation] is presented," Weiss is saying. "We can take you from living three months with no chemotherapy to living six months with it. But for that six months you won't be able to swallow anything because your mouth is raw, you'll be constantly in the hospital because of infections—but you'll live twice as long.

"But that's not how it is presented.

"We blind ourselves to this because we have to be a true believer to do this stuff," he continues candidly. "With a choice of doing nothing and watching her die, and doing something, it's hard not to do something. It's a no-win situation. It's like we're manipulating things when we don't have a lot to manipulate.

". . . Some things are bigger than us. We're reluctant to admit that sometimes. A lot of this stuff is heavy flail for little or no gain."

"I know one thing," he says at another point. "I'm glad I'm only in the MICU once a year."

As Weiss comments in an interview later: "The nurses are the real heroes. They're in there every day taking the emotional toll."

Though it's not an uplifting film, "Eventually this will be close to home for all of us," points out Richard Gliklich '88, who took a month off medical school to work on Wiseman's film crew. And he adds, "The nice thing about the film medium is that it enables people to view the situation at a more relaxed and distant time."

Gliklich got involved with the film when Wiseman was putting together a proposal for a grant from the National Endowment for the Humanities. Wise-

"I believe that helping people make a graceful exit is as important for a physician as saving lives."

man, whose son had gone to college with Gliklich, called him for his thoughts. Gliklich, now an otolaryngology resident at Mass. Eye and Ear, helped get consents, interpreted medicalese, and "scouted" for Wiseman during the filming.

"My involvement with this film brought me a whole new perspective on the issues," says Gliklich. "Behind the camera, I found myself much more on the patient's side—not like a medical student or physician. I was able to move from my academic point of view, expressed when contributing to the proposal, to a crystallization of how these issues enter into reality."

In talking about the importance of the patient's role in decision-making, Gliklich emphasizes that in the film, the questions asked of the patients and their families were not medical ones. They were questions like: If you can't breathe on your own, do we replace the tube and keep you alive on a ventilator or let you die? A medical decision, he says, is whether to do treatment A or treatment B.

"Patients have to assume a degree of responsibility for what quality of life they'll accept," he asserts. "No one can determine for someone else what constitutes a meaningful life."

During the filming, Gliklich says he was surprised how readily the patients accepted the intrusion of the film crew. Most people who were asked consented to being filmed. "They really managed to ignore us."

The human moments seem all the more remarkable in the presence of a boom microphone, a camera, and a crew of three.

Taylor says that he was "appalled" when he first walked in to his patient's room and saw the cameras—knowing the situation faced by the patient was already difficult—but he believes that the filming process had even been helpful for at least one of his two patients filmed. At the very least, "What they were experiencing was so strange, so overwhelming, so intense, that a few more people in the room didn't matter."

The human moments seem all the more remarkable in the presence of a boom microphone, a camera, and a crew of three. There's a scene in the room of a 78-year-old woman who has had a stroke and respiratory problems. Her husband, a physician, is having a hard time accepting that she might die. He is holding and stroking her hand: "It's a little swollen, dear, but that means more healing time. More healing time, dear. More healing time." His voice cracks, as he fights back tears.

Wiseman shot 80 hours of film and cut it down to about 6 hours—almost twice as long as any of his previous films. He had originally proposed that *Near Death* be two hours long, but after a short time at the hospital, he realized it couldn't be.

"Even in six hours, I only scratched the surface," says Wiseman. "Each case represents somewhat different problems. I had enough material for another two or four hours."

As Gliklich acknowledges, "It's long and at times difficult to watch." But it has been mesmerizing people. A *New York Times* reviewer, who saw it last fall at the New York Film Festival, called it "great, fearless and monumental." Before it aired on PBS on January 21, a review in *Newsweek* said: "At times you wish that someone would draw a giant bed curtain across what you're witnessing. No other documentary, however, has provided such fascinating insights into the workings of the medical mind." *Near Death* has already won one award—the l'Age d'Or prize from Belgium's Royal Film Archives.

Wiseman—who has a law degree from Yale Law School but never wanted to practice—has won three Emmys (two for *Hospital*) and two Dupont Awards from Columbia for excellence in broadcast journalism. His films are distributed through his company, Zipporah Films, in Cambridge, Massachusetts.

Wiseman says he found the making of *Near Death* "very interesting and sad." Yet because he was working, he was protected from the raw emotion. "I saw so many people die that it became common—not trivialized, but more bearable in a way. That's what happens to doctors and nurses, I suspect."

He suggests that there is a rehearsal aspect to seeing what may happen to you or those you care about. "I hope it didn't make me more callous, but more aware. I hope that's the effect the movie has.

"It was an enormous privilege to be given access to these moving, intimate moments," he says. "I just hope I can face death with a similar amount of courage." □

Ellen Barlow is managing editor of the Harvard Medical Alumni Bulletin.

IMAGES OF ILLNESS

The Person Behind the Patient

by Mark L. Rosenberg

Our images of people, the images we carry in our minds of those we love, work with and care for, are much more than purely visual images. They are composites, drawing upon all of our senses and include important details of what people say, what they sound like, how they react and how they look, feel and smell. Many of us have no sense of what it is like to get sick, be a patient and receive care for a serious illness because images of people as patients are conspicuously absent from our culture. Combining photographs and tape-recorded interviews, I followed six patients over periods of time—ranging from three months to three years—and published these photographic studies in the book, *Patients: The Experience of Illness*.

It was somewhat of a struggle to get these images into the public domain. At the hospital where I had received my medical training, administrators refused my request to take photographs because they feared giving me a "license to go fishing" in the hospital. They wanted to retain strict control over the public image of that institution.

The directors of Boston's Beth Israel Hospital and Brigham and Women's Hospital, however, were willing to take a chance. After obtaining approval from their human studies committees, I asked individual physicians to select patients who might be interested in being photographed and talking about their illness.

Those physicians explained to their patients that they were under no obligation to participate, that I would follow them as an observer and not as a physician, and that they could withdraw from the project at any time. All of the patients (except for one who died before completion of the project) reviewed the material before it was printed and agreed that it could be published using their real names.

Not all physicians were quite so enthusiastic. Early on I sought the advice of a medical school instructor of mine, who had gone on to develop health education information for the general public. He looked through the photographic essays I had completed already—accounts of two women with breast cancer—and told me what he thought. "I would not publish this," he said. "You would just be airing medicine's dirty laundry in public."

In my view it was much to his credit, and to my great relief, when, several years after the book was published, he

told me that he had changed his opinion and now thought the book was a useful document.

When he first saw those images, however, he thought they should remain private, available only to the doctors and staff working in medical settings. I suspect that, like many physicians, he viewed the hospital world of surgery, scars, and disease as the physician's world. Patients may move occasionally through this world, but it is the physician's responsibility to minimize what patients actually see.

Looking back, I realize that I too had thought that the world of illness was the doctor's world. After all, doctors work with illness 10 to 16 hours a day. They are surrounded by these images of illness; they see these photographs as live scenes and hear the comments in real time.

In fact, initially when I had thought about combining medicine and photography, physicians were going to be my primary subjects. But I soon saw that the most intense passion and drama of illness was experienced by the patients. Physicians work with illness, but patients live with it. Physicians bandage the wounds, but patients live with the scars.

Although physicians play a key role in delivering medical care, the time that a patient actually spends receiving that care constitutes only a small part of the patient's day. The illness and the concerns that it generates do not exist only when the patient is in the physician's presence. Those worries are there all the time—when the patient goes home and interacts with family, friends and returns to work.

When I began taking these photographs I did not appreciate the extent to which an illness could permeate someone's life. I did not learn about this in the course of my medical training. In medical school, we learned that we could function most effectively as physicians by looking at illness objectively, and we could do the most for our patients by mastering and applying high-technology medicine to their diseases. It was all too easy to forget that there were people involved with these diseases, people who have a vastly different perspective on their illness from that of the physician.

For me, it was only by spending time with the patients I photographed, by looking at them and listening to them for a very long time, that I came to realize how my perspective as a physician was so limited.

Working with patients, I also had the strange experience of being much more affected by some of these images when I saw them come up for the first time in the darkroom than when I saw them live. I realized I could be surrounded by images that I did not really "see." As physicians, we use defenses to protect us from painful sights just as we use defenses to protect us from painful feelings.

"Medicine's dirty laundry," then, did not *belong* to medicine at all, nor was it dirty. Illness is, to be sure, undesirable, but the person with that illness is not. There is nothing dirty about him or her. Yet, an unfortunate consequence of our thinking that illness is something to be avoided is our acting as if ill people were also to be avoided. In this way illness serves to isolate people. This is one of the themes in *Patients*. The book is, in part, an attempt to legitimize discussion about illness, to take it out of the closet. We need to feel more comfortable with the fact that people do become ill and that illness can be discussed.

In fact, sometimes the effect of not talking about illness can be worse than the disease itself. After all, we are all likely to be a patient sometime, and when we are sick we are going to be the same people, with most of the same needs and strengths, as when we are well. If we could get past the notion that someone who is sick is a different person, all of us could take a major step toward understanding that keeping in touch with patients is keeping in touch with ourselves.

Seeing what illness looks like can also remove some of the dread associated with it. Many people believe for example, that a mastectomy looks so horrible that seeing a person who had undergone one would burn an indelible, horrible image into one's brain. But even though a mastectomy leaves a scar and a deformity, it's something that we can confront. If we don't confront it, then by the very process of refusing to look at someone or part of them, we start cutting them off and stop communication. I hope that these images can show us that looking is not so difficult and that facing things is not so bad.

The words make looking at the photographs easier. They work this way because the reader knows that there is more to this patient's life than his illness, and more going on in that patient than just concern over her scar. The words create a context for the photograph, and that context is the patient's life.

In a sense then, the "images" that result are the joint product of the words and the photographs. What I have tried to do by placing photographs in the context of the individual's life seems to be the very opposite of what some modern photographers do: by capturing people off guard and out of context in an isolated moment, they make ordinary people look weird or bizarre. Combining patients' images with their stories has just the opposite effect—it makes ordinary people look extraordinarily human.

I was particularly concerned about whether my photographing these patients made their experiences with illness more difficult. Certainly standing before a camera can make one acutely self-conscious. Yet being conscious of one's self and one's appearance need not be disturbing. How the subject feels depends, in part, on how the observer and subject interact, and this shows up in the photograph.

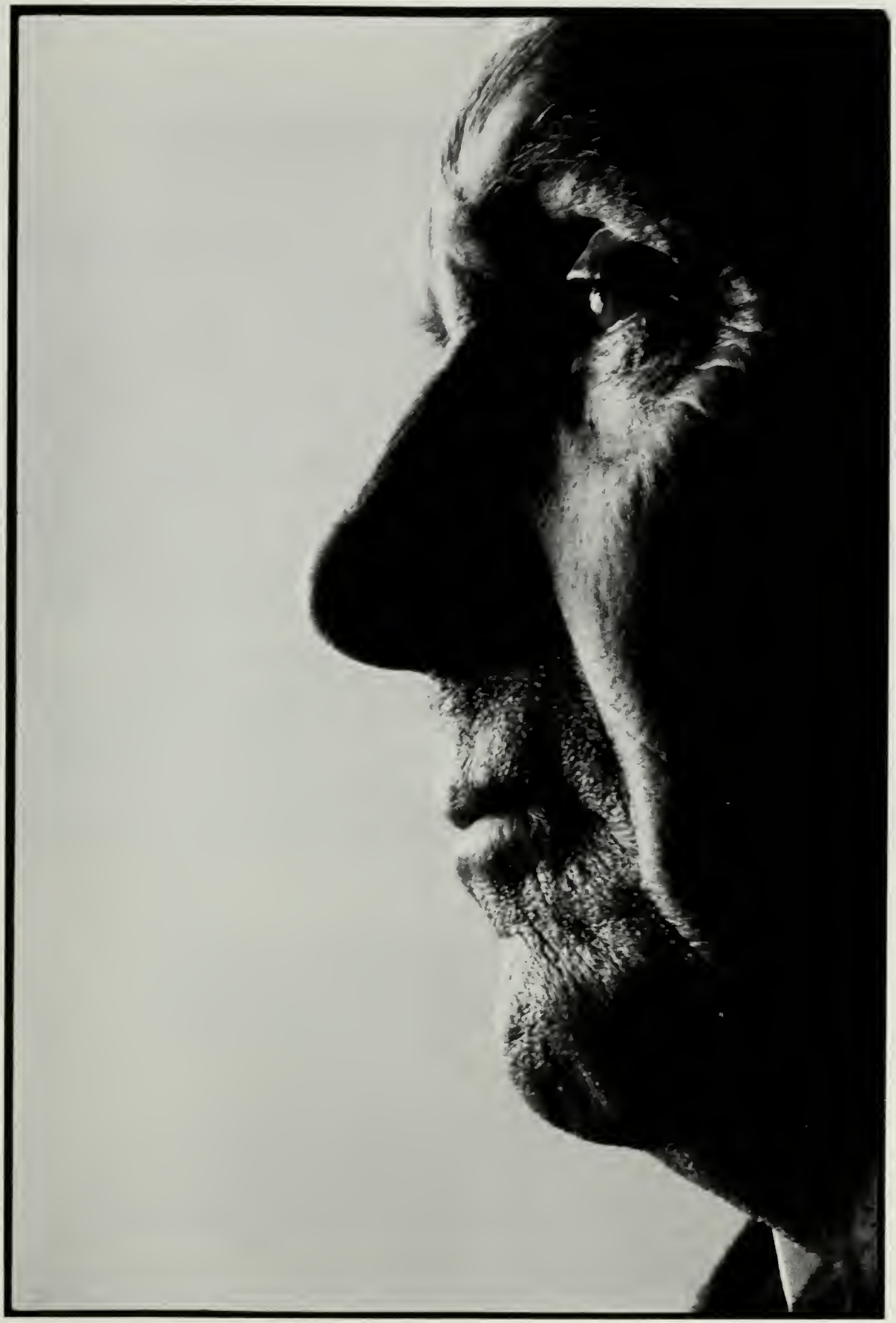
These photographs reflect my relationships with these patients, which evolved over time. Sometimes these relationships became quite close, especially after we had spent time together during some particularly difficult or painful experience. Yet despite this closeness, there were times when patients did not want to talk to me or be photographed.

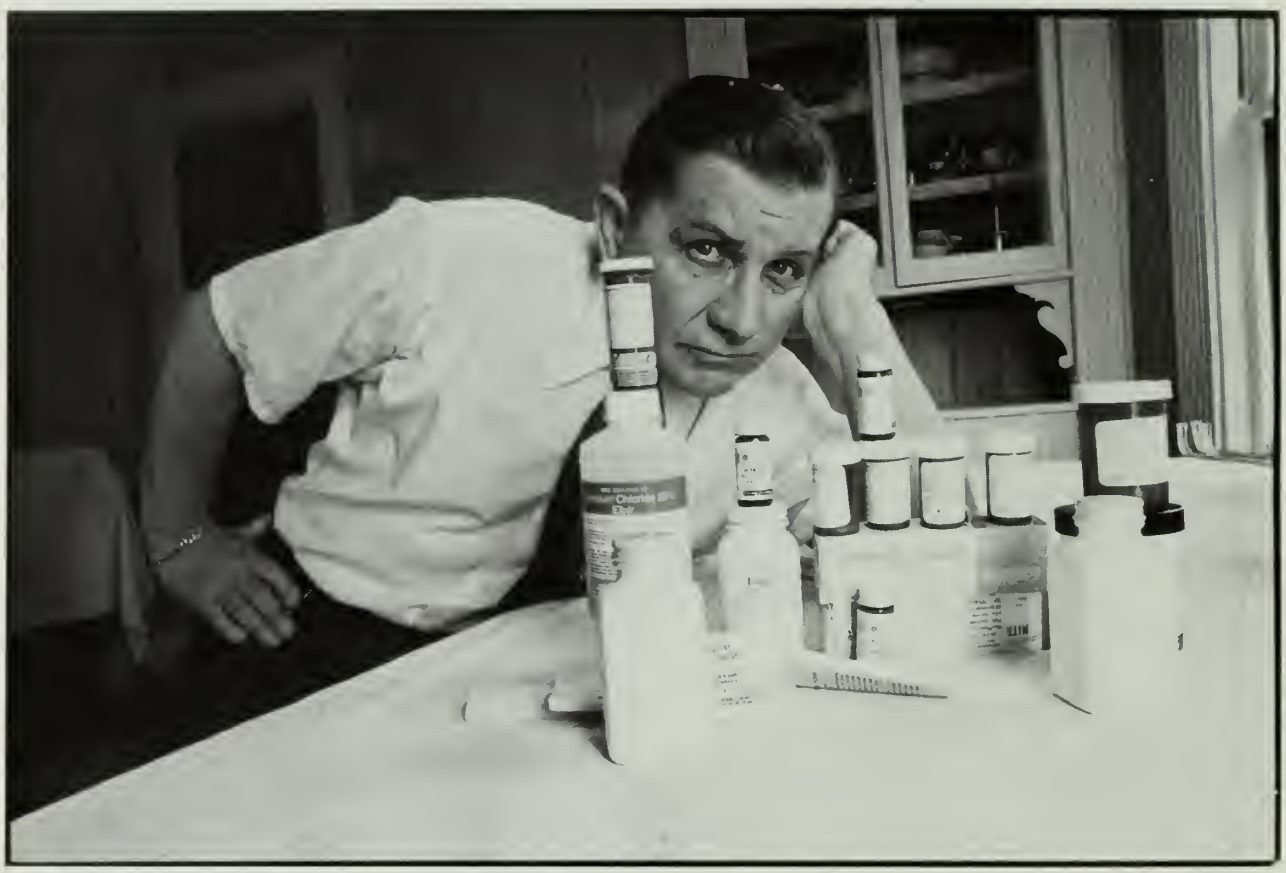
On the other hand, when I asked one patient who had had a mastectomy how she had felt about being photographed during a difficult period, she replied, "At the moment, I had been feeling very rejected, and with your support and your interest, you lessened that feeling of rejection to some degree . . . because you were a man and you were not afraid to look at me. I could not understand why my husband was. It just helped. I can't explain why or how, but it did help."

She seemed to be saying that we give something valuable to someone who is ill by being willing to see and willing to hear. What is called for is more curiosity, less judgment. Then perhaps, we can begin to understand more fully what the experience of illness can mean. □

Mark L. Rosenberg '72, photographer/author of Patients: The Experience of Illness *(The Saunders Press, 1980), is an internist, psychiatrist and director of the Division of Injury Control at the Centers for Disease Control. He is working on a second book of photographic essays, which will explore the experiences of people with mental illness.*

PHOTOS AND CAPTIONS FROM *PATIENTS: THE EXPERIENCE OF ILLNESS* (SAUNDERS PRESS, 1980). © COPYRIGHT MARK L. ROSENBERG, MD.





EDWIN MACPHEE

Well, you know. I just have to pop a little nitroglycerin under the tongue, wait a minute, and the pain's gone; everything's okay. I always take a nitro as soon as I get the pain or before doing something that might bring on the pain. I take one on rising in the morning at 5:30, just contemplating the movement of washing my face. About a quarter of six, I take 40 milligrams of Inderol and I put two inches of nitroglycerin paste on my leg; all those pills and paste applications are repeated every six hours. At 8:00 in the morning, I take one tablespoon of potassium, one half a tablet of Lasix, and three digoxin. I also take between 10 and 15 nitroglycerin tablets a day. My alarm clock wakes me up at night to take my pills at 3:00 am.

January 24, 1979

EDWIN MACPHEE

I know Dr. Collins and his fine team will do an excellent job and practically eliminate the angina for me. I feel very confident that everything is going to turn out well. Could I be overdoing my confidence in this surgical team? I keep saying that I'm confident in Dr. Collins because you have to be confident. So I'm going to do it and it's going to be great.

January 24, 1979

EDWIN MACPHEE

There's a risk and that's what you think about, that's what shakes you up. Am I going to get up off the table? Will my heart—what's left of my heart—withstand the situation? That's the question in my mind.

January 24, 1979

IMAGES OF ILLNESS

DR. COLLINS
The good physician knows that his work—which may appear terribly complicated to the layperson or patient—is really made up of simple parts. It's the same type of knowledge that separates the audience from the magician.

February 8, 1979

RICHARD CAMP
(a fellow patient)
People seem to be a lot friendlier with each other here because they don't want to be afraid, afraid of leaving their families, afraid of death.

February 12, 1979

EDWIN MACPHEE

When I used to get those terrible attacks of angina I felt that one of them was just going to take me out of it. I'm not as nervous now.

Barbara and I seem to discuss things more. We talk about things we see in the newspaper and current events, where before it was just a constant concern about my health.

And today we're off on our little vacation. You know, the one they said I wouldn't live for.

August 15, 1979

In Absence of Tears

by Jim Cashel

When receiving injections, the refugee children from Nicaragua don't cry. It took me a long time working in the swollen refugee camps of Costa Rica to get used to that. Children are *supposed* to cry. They're *supposed* to be dragged, thrashing and teary-eyed, towards the stranger in white. They're *supposed* to be in petrified agony, as they always are in Boston hospitals, and in other clinics I have worked around the world.

But Nicaraguan children don't cry. They stand stoically in line, awaiting their turn, looking much older and wearier than the ages on their registration forms. I don't know the reasons, but I can speculate why their eyes stay dry:

PHOTOS COURTESY OF UNITED NATIONS HEADQUARTERS, OFFICE FOR THE HIGH COMMISSIONER FOR REFUGEES

- They're too tired to cry. Upon their arrival to Costa Rica, these children have completed a dangerous and exhausting trek from Nicaragua. Usually on foot, they often come through areas of battle. The journey, which commonly lasts several weeks, is difficult for an adult. For a four-year-old child, it is brutal.
- These children don't *know* to cry. Pitifully few—perhaps none—have ever seen a doctor or a needle before.
- Finally, they can't cry. It's been said before, but it's worth repeating, that children take the brunt of war. It's the children who lose their families, their homes and the insouciance of childhood. Receiving an injection—so traumatic an event for an American kid—can't begin to trouble these children.

Occasionally, if the needles we're using are particularly dull and painful, or if we need to give three or four shots, the smallest of the children—the two- and three-year-olds—begin a sort of silent, private sobbing from the agony of it all. Theirs are tiny whimpers, with saddened and broken looks to their mothers for help. But even then, for the majority of them, their eyes stay dry. These boys and girls who have lost so much—family, health, safety and country—have even been deprived of the most characteristic and essential part of any childhood: they've lost their tears. □

Jim Cashel '90 received a Sinclair Kennedy Travelling Fellowship last year to work in health programs in Costa Rica.

Prime Time

The Making of a Better Doctor

by Cheryl Dorsey

I suppose the merits of television as a cultural medium are debatable. One has only to peruse prime time television listings or to flip through the 80-odd channels of cable television to witness the veritable dearth of truly educational and intellectually stimulating programming. I dare say, however, that in history's final accounting, television will take its place alongside the advent of the printed word and the transportation industry as one of the great forces responsible for linking peoples, places and ideas. Providing access to the unknown and the unfamiliar as a segue into knowledge stands as television's ultimate utility.

Of course, none of these thoughts even entered my mind when I agreed to participate in the "NOVA" television production entitled, "Can We Make a Better Doctor?" This rather ambitious project aims to examine longitudinally the effects of HMS's New Pathway curriculum on a generation of future physicians. For a total of 10 years, "NOVA" will follow me and five other HMS students as we are transformed from medical students to practitioners.

As I consider myself a reasonably thoughtful person, I am somewhat embarrassed to admit that I committed myself to this long-term endeavor based on the thought that it might be "kind of fun" to be on television. The ramifications of my decision have been multifold; some positive and some negative, but certainly always interesting.

The "glamour" that surrounds television and its public personalities is now forever lost to me after spending time with a film crew. As a first- and second-year medical student, most of the filming involved personal and small group interviews, with the discussion guided by the director's prepared questions. The helpful suggestion to "just act natural" during filming was taken to heart as I often acted exactly as I felt—uncomfortable.

The question and answer sessions during my pre-clinical years were certainly benign compared to the filming of some of my clinical experiences. The actual logistics of having a film crew follow me around in the hospital during a "typical" day were complex. The public relations office of the hospital always had to be consulted. Issues of patient privacy and confidentiality were paramount and rightfully so.

One of the most striking revelations as I made the transition from the classroom to the hospital was the degree of

responsibility I was accepting in my role as a student doctor. By virtue of my position, patients automatically accepted me into their lives. I was given access to their bodies and to some of their innermost thoughts. The uniqueness of this type of relationship was magnified each time "NOVA" requested to film me during a particular rotation. It was never a simple decision to give my consent to be followed by the film crew.

During my psychiatry rotation I ultimately refused to be filmed interviewing one of my patients because I could not convince myself that the value of this encounter outweighed the sacred nature between psychiatrist and patient. This of course was my personal decision and it was important to me that I was never forced into a situation that compromised my beliefs.

I often think that what is most entertaining about the "NOVA" production is the behind-the-scenes action. It is never an easy task to amass the film crew—with all of its necessary trappings including cameras, lights, microphones, and endless lengths of extension cord—and assume an inconspicuous position in any hospital ward. During my obstetrics and gynecology rotation, the imminent arrival of the cameras was heralded by boisterous choruses of "Hurray for Hollywood" sung by the obstetrics nurses. The preceding week had been brisk in terms of deliveries so everyone, not least of all the show's director, was hopeful for an exciting day of filming.

As we all know, however, Murphy's Law is alive and well, and the baby boom came to a screeching halt just as the cameras appeared. One expectant mother became the center of attention. All hopes were pinned on her and her neonate; every cry of pain became our call to action. As the medical student assigned to the case, my presence at the birth of her baby was assured. Unfortunately, the same was not to be said for the lights and the cameras.

When the obstetrician-on-call broached the subject of filming the delivery, the patient questioned her ability to think clearly under the circumstances and deferred any decision to her husband. As the patient's husband had not arrived yet, this proved to be a disastrous development for "NOVA." Yet every time the patient dug her fingernails into my hand, every time she begged me to hold her hand, with every expletive uttered I understood what she was experiencing. Ultimately, no delivery was filmed that day.

The family was amenable to being filmed after the delivery during the baby's first minutes of life, after the baby's mouth and nose were suctioned, umbilical cord clamped, and Apgar scores calculated. It was decided that I should do something "doctorish" during this time. As is so common during a medical student's clinical years, I had absolutely no idea what to do and was spared only by the suggestion of one of the nurses to weigh the baby.

I anxiously await the program's next installment in order to see if this segment is included. If it is, I will be portrayed ineptly trying to pick up a vigorously wriggling infant and to disengage him from his tightly wrapped blanket, only to dump him somewhat unceremoniously onto a scale I realized too late that I did not know how to read.

I venture to speculate that most medical students can relate similar anecdotes, yet it is not often that we have time to reflect on the meaning and importance of such experiences to our education. I describe medical school as an indescribable experience. First-year students are often overwhelmed and confused as they are faced with digesting and synthesizing an enormous body of knowledge unlike anything encountered as an undergraduate. Second-year students are often overwhelmed and overworked trying to navigate successfully the transition from the classroom to the bedside. Third-year students are generally overwhelmed and scared feeling ill-prepared to deal with the demands of clinical medicine.

In trying to understand what the "NOVA" program hopes to accomplish in depicting the experiences of six HMS students, I have come to a better understanding of what is happening to me as I evolve from a medical student into a medical professional. The only question that remains is the ability of "NOVA" to sensitively and insightfully document this transition.

As the title of the series proclaims, one of the goals of the program is to examine the effect of the new HMS curriculum on the type of physicians HMS produces. Not only must "NOVA" attempt to describe what it means to be a "good" doctor, but also what it means just to become a doctor. This is certainly no easy task. The fraternity of medicine is difficult to penetrate.

As medical students, the donning of white coats is an initial step. Slowly we are introduced to the hierarchy of the system. There is the medical student (often better known as the "scut monkey") followed by the intern and the resident, followed by the chief resident and the attending. We even have

During my obstetrics and gynecology rotation, the imminent arrival of the cameras was heralded by boisterous choruses of "Hurray for Hollywood" sung by the obstetrics nurses.

My participation in the "NOVA" production has forced me to be more aware of the forces that are today shaping me into the physician that I will be tomorrow.

our very own jargon, medical and scientific terminology that makes it difficult even for the most astute patient to understand a bedside presentation of his/her case.

Obviously, the cameras are unable to capture every moment of a medical student's career, which makes the choice and the timeliness of their periodic appearances even more crucial. No cameras were there at 4:30 AM when my alarm clock rang each morning during the month I spent on surgical service. No cameras have been there to watch me prepare a thorough case presentation of one of my patients, only to have the attending ask me an obscure question about the case to which I can only reply "I don't know." They were not there as I unsuccessfully tried to start my first I.V., only to have the patient cry out in pain. And the cameras have not been there when patients have died.

Cheryl Dorsey being filmed in the Medical Education Center.

I recently had the honor of knowing a 46-year-old woman who fought cancer for a number of years. She was a legend in the hospital, having survived longer than anyone expected. When I met her she had recently been readmitted to undergo another round of chemotherapy. She was a fighter. She demanded smiles during morning work rounds and gave new meaning to the words positive outlook despite the seriousness of her illness. For three weeks the morning routine was basically the same: a brief chat, a quick listen to her heart and lungs, a check for any hemorrhaging, and a discussion of the day's medical plans.

I never doubted that she would recover and leave the hospital to return to her family until the morning I walked into her room only to find an empty bed stripped of its sheets. A cleaning woman was in the room washing down the walls. That was my final memory of a remarkable person. The haunting quality and sadness of that final image will always be with me.

I am sure that every medical student has a compendium of similar stories and experiences. This is the tie that binds; that which strengthens the fraternity of medicine for better or for worse. The mandate of "NOVA" is to delve into this swirling array of emotions and feelings and to extract something that is useful to the public. I would surmise that those involved in the final editorial process have some vision of what this will be. As for my participation in the "NOVA" production, it has forced me to be more aware of the forces that are today shaping me into the physician that I will be tomorrow.

I suppose that I am also curious about what impact, if any, the first installment of the television series had. I hope the issues raised by the show engendered at least some useful and productive discussions from within the medical community as well as from without. At a time when the number of applicants to medical school is declining, and the levels of frustration and discontent among medical professionals seem to be climbing, it does not seem inappropriate to address some of the tough issues that face physicians early in their training. The general public would also seem to benefit from "NOVA's" encroachment into medicine's carefully guarded territory. The program may help to demystify much of the training process that is all too well understood by medical students.

On a number of occasions since the first program aired last year, I have been approached by undergraduates interested in the medical profession, as well as by those who simply enjoyed the show and wanted to know more about my experiences as a medical student. This encourages me that television can fulfill one of its nobler purposes as a tool of access and a distributor of information.

Whether I shall continue to feel as encouraged after being "followed" by a film crew intermittently over the course of the next 10 years of my medical career remains to be seen. I just hope that the final answer to the rather fanciful title "Can We Make a Better Doctor?" is a resounding "Yes!" □

Cheryl Dorsey '91 is interested in pursuing public policy as it relates to children and poverty.

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